

## CHAPTER 2

# FIBERBOARD AND PAPERBOARD CONTAINERS

## FIBERBOARD BOXES

### DESCRIPTION OF FIBERBOARD BOXES

A fiberboard box is a container made of one or more pieces of corrugated or solid fiberboard. The pieces are creased, slotted, joined, and folded according to standard styles described in ASTM D 5118, ASTM D 1974 and illustrated in figures 2-6, 2-7, 2-8, and 2-9.

### USE OF FIBERBOARD BOXES

The quantity of fiberboard boxes used in military shipments are increasing steadily and rapidly. A fiberboard box weighs considerably less than a wooden box of the same capacity. This difference in weight is a factor when large shipments are involved, as any saving of weight is reflected in lower shipping cost and easier handling. The main requirements for a shipping container are light weight, low cost, ability to withstand rough handling, and ability to protect the contents against loss or damage. Motor trucks, airplanes, container cars, skid platforms, lift trucks, platform slings, and palletized loads have been important factors in reducing transportation and handling hazards, thus expanding the use of lightweight fiberboard boxes.

Advantages in the Use of Fiberboard Boxes. Fiberboard boxes are adaptable to a great variety of packaging and packing conditions. They offer the following advantages:

- They are made of materials of exactly the specified strength and water resistance.
- They are prefabricated.
- They are made in several styles to suit different shapes and sizes of items.
- They are shipped and stored in the flat, and hence save shipping and storage space.
- They are easy to assemble and handle.
- They are light in weight and relatively strong.
- They are neat in appearance and easy to mark.
- When packed, they occupy less space than most other containers of the same inside dimensions.

### CLASSIFICATION OF FIBERBOARD BOXES

Fiberboard boxes, for domestic and oversea shipments, have been consolidated under ASTM D 5118 and ASTM D 1974. Fiberboard material must conform to ASTM D 4727. Boxes may be procured or fabricated in the following types and classes:

- Types (see fig 2-1)
  - Type CF Boxes - Type CF boxes are fabricated from corrugated fiberboard (CF) stock. Corrugated fiberboard has

two varieties: Single-wall (SW) and double-wall (DW) construction.

- o Type SF Boxes - Type SF boxes are fabricated from solid fiberboard (SF).

- CLASSES

- o Domestic class boxes are made to meet the requirements of table 1, ASTM D 4727 for bursting strength and the weight of the facing materials. (See figure 2-1, table 2-1.)

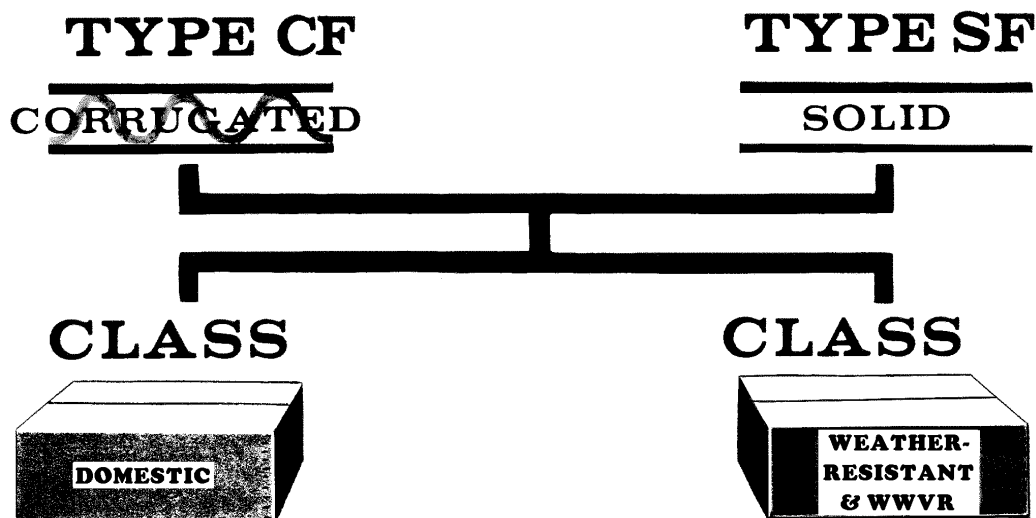
- Corrugated fiberboard, class weather-resistant (WR), and waterproof and water vapor resistant (WWVR) - The WR and WWVR boxes, both single and double wall, will meet the bursting strength and thickness for the grade and variety as described in table 2, ASTM D 4727. (See figure 2-1, table 2-2).

### Grades of fiberboard

Different strengths of fiberboard are indicated as grades. Grades of fiberboard for class domestic are types CF and SF. Type CF is differentiated by PSI (pounds per square inch) of bursting strength (tables 2-1 through 2-4).

Weather-resistant grades of fiberboard are identified by a letter-number combination such as V2, V3, W5, and W6 which represent different bursting strengths. The numeral in each combination represents the grade of material and the letter in each combination represents a kind of fiberboard (V- or W-board). V-board is a heavy-duty, highly weather-resistant board, and W-board is a lower strength, highly weather-resistant board (see table 2-2).

Type CF (corrugated fiberboard) can be obtained in grades 3, 5, 6, 11, 13, and 15, with compliance symbols of V3c, W5c, W6c, V11c, V13c, and V15c. The small "c" indicates corrugated fiberboard.



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Figure 2-1. Classification of fiberboard boxes.

Type SF (solid fiberboard) can be obtained in grades 125, 175, 200, 275, 350, 500 and 600 with compliance symbols of V2s, V3s, V4s, W5s, and W6s, as shown in figure 2-1, tables 2-3 and 2-4, which are taken from ASTM D 4727. The small "s" indicates solid fiberboard.

Waterproof and water vapor resistant (WWVR) grades of fiberboard are identified by a letter-number combination followed by the letter "WWVR". Waterproof and water vapor resistant boxes are fabricated from type CF (corrugated fiberboard) and can be obtained in grades V3c, W5c, V15c, and W6c (each followed by "WWVR") in the single wall variety and grades V11 and V13 (each followed by "WWVR") in the double-wall variety.

Table 2-1. Type CF (Corrugated Fiberboard), Domestic

Variety	Grade	Combined Weight Facings Only, min	Bursting Strength, Dry, min <sup>A</sup>	
		lb/1000 ft <sup>2</sup> (g.m <sup>2</sup> )	psi (kPa)	
SW	125	52(254)	125(862)	
SW	150	66(322)	150(1034)	
SW	175	75(366)	175(1207)	
SW	200	84(410)	200(1379)	
SW	275	138(674)	275(1896)	
SW	350	180(879)	350(2413)	
DW	200	92(449)	200(1379)	
DW	275	110(537)	275(1896)	
DW	350	126(615)	350(2413)	
DW	500	222(1084)	500(3447)	
DW	600	270(1318)	600(4137)	
			Puncture	
			in. oz/inches of tear	(J)
TW	1100	264(1289)	1100	(33)

<sup>A</sup> Only one burst of the initial six may fall beneath the minimum required. Domestic board failing to pass this test will be accepted if, in a retest consisting of 24 bursts (12 from each side of the board), not more than 4 bursts fall below the minimum value required.

Table 2-2 Type CF (Corrugated Fiberboard), Weather-Resistant, and Water and Water Vapor Resistant Classes (WWVR)

Variety	Grade <sup>A,C</sup>	Thickness, in. (mm) <sup>B</sup>		Bursting Strength, psi (kPa), min avg	
		Corrugating Medium	Outer Facings	Dry	Wet <sup>D</sup>
SW	V3c	0.010(0.254)	0.023(0.584)	400(2758)	150(1034)
SW	W5c	0.010(0.254)	0.016(0.406)	275(1896)	100(689)
SW	W6c	0.010(0.254)	0.010(0.254)	175(1207)	50(345)
DW	V11c	0.010(0.254)	0.023(0.584)	600(4137)	300(2068)
DW	V13C	0.010(0.254)	0.016(0.406)	400(2758)	200(1379)
DW	V15c	0.010(0.254)	0.010(0.254)	300(2068)	100(689)

<sup>A</sup> Includes WWVR grades.<sup>B</sup> A - r%, or unlimited plus tolerance shall be permitted.<sup>C</sup> For doublewall fiberboard, the inner facing shall be the same thickness as the outer facing.<sup>D</sup> After 24 h immersion (see 9.2.1)

Table 2-3 Type SF (Solid Fiberboard): Class Domestic, All Grades

Grade	Combined Weight of Plies Before Lamination, lb/1000 ft <sup>2</sup> (g/m <sup>2</sup> ), min	Bursting Strength, psi (kPa), min <sup>A</sup>
125	114(557)	125(862)
175	149(727)	175(1207)
200	190(928)	200(1379)
275	237(1157)	275(1896)
350	283(1382)	350(2413)
500	330(1611)	500(3347)
600	360(1758)	600(4137)

<sup>A</sup> Only one burst of the initial six may fall beneath the minimum required. Domestic board failing to pass this test will be accepted if, in a retest consisting of 24 bursts (12 from each side of the board), not more than 4 bursts fall below the minimum value required.

Table 2-4 Type SF, Class Weather-Resistant, All Grades

Grade	Thickness, in. (mm) <sup>A</sup>	Bursting Strength, psi (kPa)	
V2s	0.090(2.29)	550(3792)	500(3447)
V3s	0.090(2.29)	400(2758)	150(1034)
V4s	0.080(2.29)	400(2758)	150(1034)
W5s	0.075(1.91)	275(1896)	100(689)
W6s	0.060(1.52)	175(1207)	50(345)

<sup>A</sup> A" 10% tolerance shall be permitted.

### Capabilities of Fiberboard Boxes

The three principal factors affecting the carrying capacity of corrugated and solid fiberboard boxes are resistance to compression, strength at the score lines, and resistance to puncture. A fourth factor that should be taken into consideration is the ability of fiberboard to resist the weakening effect of moisture. The importance of the first three factors varies according to the commodity for which a particular box is designed, and the type of interior packing employed.

Resistance to compression, for example, is a relatively minor factor when the contents support the walls of the container or when the interior packing furnishes the necessary support. When these factors are not present, the shipper must make certain that the container has sufficient resistance to compression to prevent it from caving in when it is placed in the bottom tier of a pile of similar boxes. Corrugated and solid fiberboard boxes may be used to ship articles that are not readily susceptible to damage resulting from ordinary distortion of the container. The manner in which a commodity is packed governs to a great extent its condition on arrival at destination. Therefore, the selection of the proper style, class, and grade of fiberboard box should be carefully considered to ensure the commodity against the hazards of storage, shipment, and handling.

The items normally packed in fiberboard boxes are type 1 or type 2 loads. Type 3 loads should be converted to type 1 or type 2 loads by proper interior packing.

### Uses and Limitations of Class Domestic Fiberboard Boxes

The uses of fiberboard boxes are essentially as indicated above. Many variations of special die-cut inserts, scored pads, and partitions can be fabricated to give additional protection to the item. The columns for corrugated and solid fiberboard (CF and SF) show the minimum bursting strength of the fiberboard in pounds per square inch which determines the grades.

### Uses and Limitations of Class Weather-resistant and WWVR Fiberboard Boxes

V-board was developed primarily for the fabrication of exterior containers for oversea shipment. W-board was developed primarily for the fabrication of interior containers which are packed in exterior containers for oversea shipment. At oversea points, the exterior pack is sometimes removed and the W-board boxes become the exterior containers. When W-board boxes are used as exterior containers, their weight and dimensional limitations should

not be exceeded. Although both V- and W-boards are highly water resistant, boxes made from these materials will permit the entrance of water through the corners and joints. When packed items are of such a nature as to be damaged by water, waterproofing is provided by the use of individual wraps of material conforming to PPP-B-1055; by the use of case liners conforming to MIL-L-10547; or by the use of waterproof, pressure-sensitive tape conforming to ASTM D 5486, applied as shown in figure 2-2 after proper closure of the box. In accordance with ASTM D 5118, tables 2-5 and 2-6 are used to determine the weight and size limitation when class weather-resistant fiberboard boxes are required. Compliance symbols are given in the first column.



Figure 2-2. Sealing Method B.

Table 2-5 Size and Weight Limitations for Types CF<sup>A</sup> and SF<sup>A</sup> Domestic Fiberboard Boxes

Type CF Variety		Type SF	Max Weight of Boxes		Max Inside Dimensions
SW <sup>4</sup>	DW <sup>4</sup>		and Contents		Length + Width + Depth
Grade	Grade	Grade	lb	(kg)	in.
125	.....	125	20	(9.1)	40
150	.....	.....	30	(13.6)	50
175	.....	175	40	(18.1)	60
200	200	200	65	(29.5)	75
275	275	275	90	(40.8)	90
350	350	350	120	(54.4)	100
	500	500	140	(63.5)	110
	600	600	160	(72.6)	120

<sup>A</sup> Explanation of abbreviations in Table 1

CF - Corrugated Fiberboard

SF - Solid Fiberboard

SW - Singlewall Fiberboard

DW - Doublewall Fiberboard

Table 2-6 Size and Weight Limitations for Class Weather-Resistant (WR) and Water/Vapor Resistant (WWVR) Fiberboard Boxes Used as Exterior Containers<sup>A</sup>

NOTE - The gross weight and size limit expressed in the circular or rectangular boxmaker's certificate shall conform to the requirements of the Uniform Freight Classification or National Motor Freight Classification Rules, as applicable, and may not necessarily be the same as those stipulated in Table 2.

Grade <sup>B</sup> (Compliance Symbol)	Max Weight of Boxes and Contents		Max Inside Dimensions Length + Width + Depth	
	lb	(kg)	in.	(mm)
V2s	120	(54.4)	100	(2540)
V3s, V4s, and V3c	90	(40.8)	90	(2286)
W5s and W5c	65	(39.5)	75	(1905)
W6s and W6c	30	(13.6)	30	(762)
V11c	160 <sup>C</sup>	(72.6)	120	(3048)
V13c	120	(54.4)	100	(2540)
V15c	90	(40.8)	90	(2286)

<sup>A</sup> Not applicable to interior boxes

<sup>B</sup> Reference Specification D 5118/5118M for specific details of construction

<sup>C</sup> Maximum weight may be increased to 225 lb (102 kg) provided the manufacturer's body joint is fastened with metal fasteners spaced not more than 1 in. (25 mm) apart (see 8.1.8)

## MATERIALS

### Corrugated Fiberboard

Corrugated fiberboard is fabricated of flat sheets of paperboard (called facings) glued to the crowns of a corrugated sheet of the same material. Strength requirements are obtained by varying caliper, number, and quality of the component facings and the corrugated medium. Corrugated fiberboard has low resistance to puncture but affords a high degree of resilience and cushioning. Single-wall (SW, also called double-faced), corrugated fiberboard consists of two outer paperboard facings laminated to a corrugated sheet between them (fig 2-3). Double-wall (DW) corrugated fiberboard consists of three flat facings and two corrugated sheets, a center facing, a corrugated sheet, and a facing (fig 2-3). It is this combination of flat and corrugated sheets that gives corrugated fiberboard its qualities of strength and resilience. Corrugated fiberboard is constructed with different kinds and arrangements of flutes. The "A" flute, with 36 plus or minus 3 flutes per linear foot, is generally used where cushioning of contents is desired. The "B" flute, with 50 plus or minus 3 flutes per linear foot, is used where the contents that support the box are of low fragility. The "C" flute, with 42 plus or minus 3 flutes per linear foot, can be made to serve either purpose. The "E" flute is 94 flutes per foot, plus or minus 4 flutes (fig 2-4). The "A" flute is the largest of the three and its strength is realized in stacking applications. Its ability to withstand impact as well as its resistance to flat crushing is the lowest of the four flute sizes due to the lesser number of flutes per linear span. The smallest standard flute size, "E", is the weakest in terms of stacking strength, but it performs very well under puncture and flat crush stress. The "C" flute, which is the middle size flute, will perform moderately well in all three areas--stacking, puncture, and flat crush. It is used where maximum strength in any one area is not required, but where weakness in no area can be tolerated.

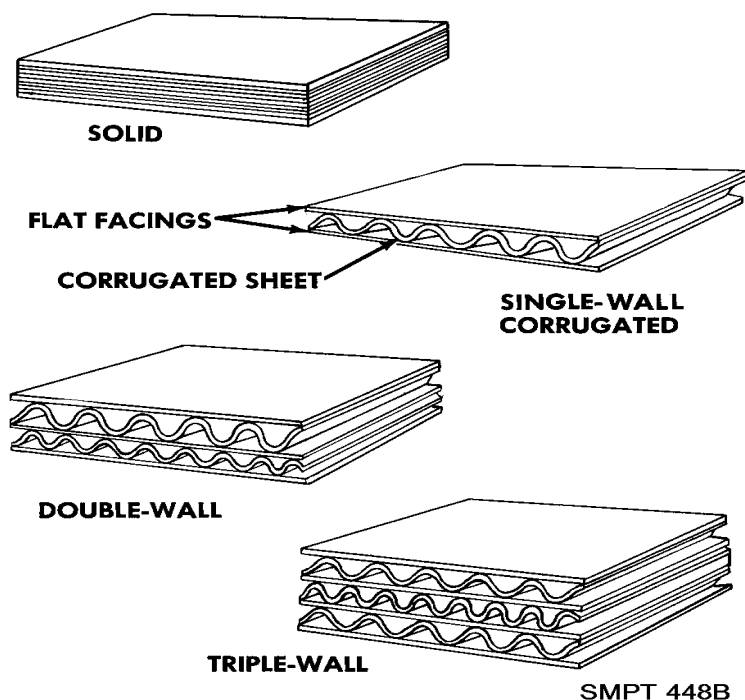


Figure 2-3. Types and varieties of fiberboard.



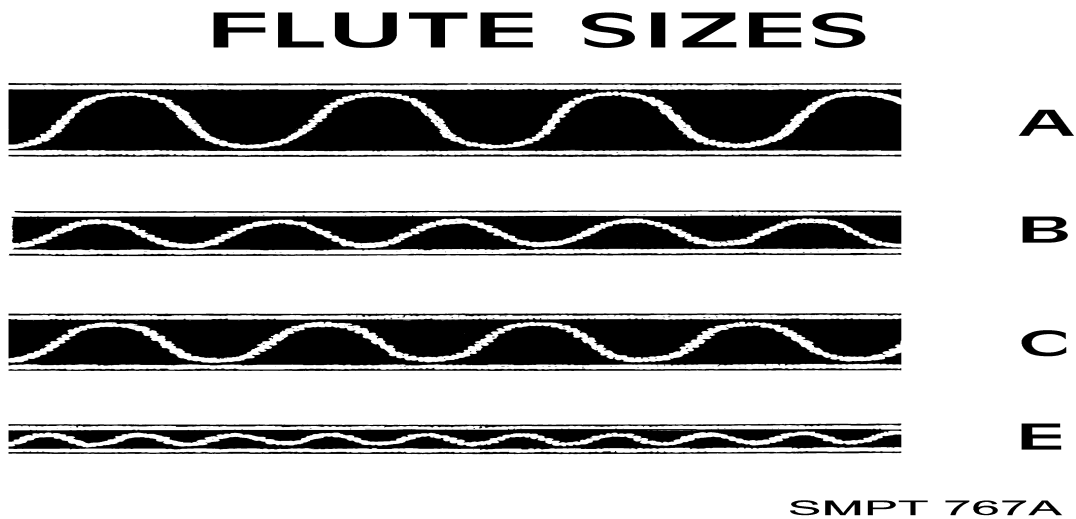


Figure 2-4. Corrugated fiberboard flutes.

**Domestic Fiberboard Boxes**

Variety SW fiberboard used to fabricate type CF boxes will be A, B, C, or E flute at the option of the supplier. Variety DW fiberboard used to fabricate type CF boxes will be any combination of A, B, C, or E flutes, except they shall not be BB, EE, or BE flute. Type CF boxes, fabricated from variety SW or DW fiberboard shall have the flutes running perpendicular to the scores of the box openings. When specified, the flutes for variety SW or DW fiberboard will run horizontal to the scores of the box openings for boxes of a size that the top and bottom openings are on the smallest panels.

**Weather-Resistant And WWVR Fiberboard Boxes**

Variety SW fiberboard used to fabricate type CF boxes will be either A, B, or C flute as specified. Conventional slotted type CF boxes shall have the flutes run perpendicular to the scores of the box openings. When specified, the flutes for these boxes shall run horizontal to the scores of the box openings for boxes of a size and style that the top and bottom openings are on the smallest panel. For Styles DBLCC and IC boxes (fig 2-7), they shall have the flutes run the depth of the box perpendicular to the opening.

**Solid Fiberboard, Type SF**

Solid fiberboard consists of two or more flat plies of paperboard laminated together with an adhesive applied over the entire area of contact between the sheets (fig 2-3). The combined material is solid, hard, and rigid, and boxes fabricated from it resist puncture to a high degree but offer little cushioning to their contents. They do, however, offer greater resistance to rough handling and wear, and are better adapted for use in shipping heavier and less fragile items than those shipped in corrugated fiberboard boxes. If the weight of the box and contents does not exceed 40 pounds, the fiberboard will not be less than two-ply. If the weight exceeds 40 pounds, the fiberboard will be not less than three-ply.

**Tapes**

Among the tapes most commonly used for closing and sealing fiberboard boxes are--

- ASTM D 5486, a pressure-sensitive water-resistant, paper-backed tape, normally used to close interior containers. ASTM D 5486 is also a pressure-sensitive waterproof tape, used to close and waterproof interior and exterior fiberboard boxes.
- A-A-1492, A-A-1671, a reinforced, paper-gummed tape, used for sealing fiberboard containers for domestic shipment and storage.

### **Adhesive**

Adhesive used for closing fiberboard boxes will conform to MMM-A-250.

### **Metal fastenings**

Metal fastening for securing the manufacturer's joint and closing class weather-resistant and WWVR fiberboard boxes, will be commercially preformed staples or staples from commercial steel stitching wire. The staples will be treated with a commercially applied coating of zinc or copper wash to resist corrosion. ASTM D 5118 and ASTM D 1974 specifies the sizes of staples to use.

### **Reinforcing materials**

Flat steel strapping ASTM D 3953; nonmetallic strapping, ASTM D 3950; or pressure-sensitive, filament-reinforced tape ASTM D 5530 are used to reinforce packed and closed fiberboard boxes. Another document to reference is ASTM D 4675, Standard Guide for Selection and Use of Flat Strapping Materials.

### **Fabrication of the Boxes**

Cutting, scoring, and slotting. Special machines are used to cut, score, and slot the fiberboard material so that it can be made into a box.

### **Body joint (manufacture's joint)**

Domestic boxes, types CF and SF. The body joint (manufacture's joint) of domestic, corrugated fiberboard boxes will be either overlapped or butted, as specified (fig 2-5). The type SF joint shall be overlapped.

### **Overlapped Joint (Joint Tab)**

The joint shall be made with fiberboard joint tab overlap not less than 1 1/4 in. (32 mm) wide with the length of the overlap equal to the inside depth of the box. The joint tab may be an extension of either the end or side panel of the box. When specified the joint tab may extend into the flap area and be secured. The joint tab shall be fastened either inside or outside the adjoining panel and the top and bottom edges of the front tab shall be no more than 3/16 in. (5 mm) below the top or above the bottom scoreline of this panel. The overlapped joint of type CF boxes shall be fastened with adhesive. The toxicity requirement may be waived when packing items other than food. When adhesive is used it shall be applied so as to cover the full area between the joint tab and the adjoining panel. The adhesive shall substantially extend to all edges of the overlap. The overlapped joint of type SF boxes shall be fastened with metal fasteners. Metal fasteners for the type CF and type SF boxes having a depth dimension of 18 in. (457 mm) or less shall be spaced not more than 3 in. (76 mm) apart center to center.

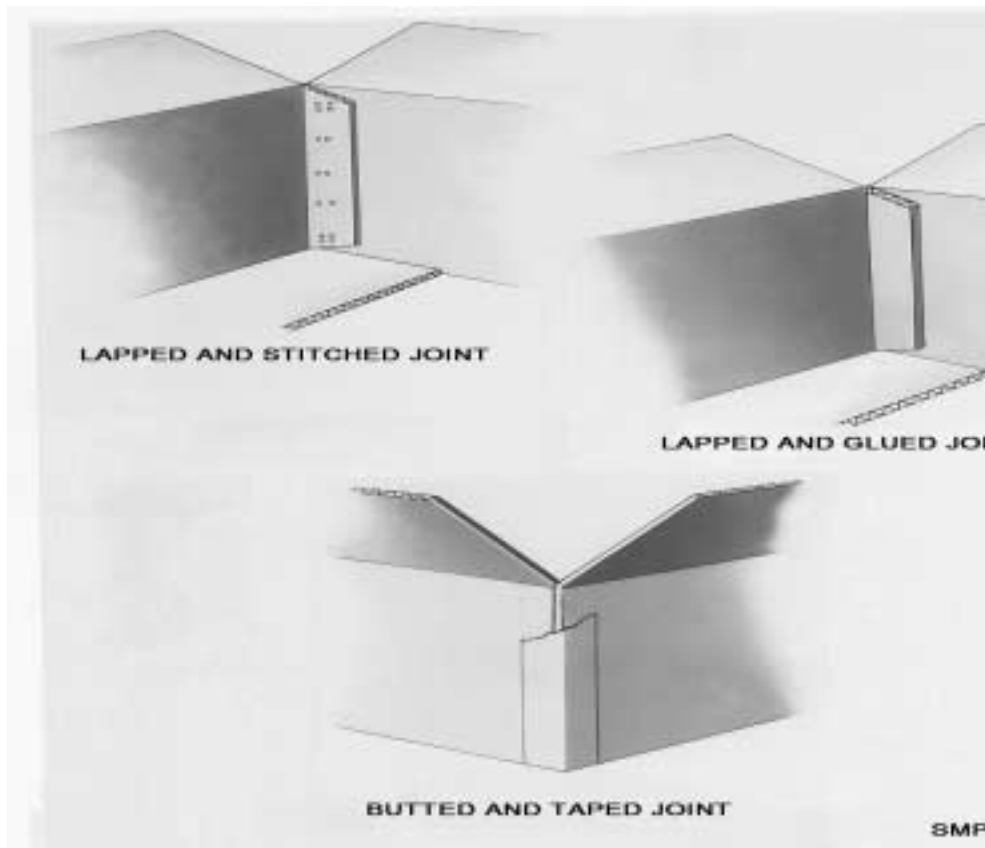


Figure 2-5. Body joints for fiberboard boxes.

Metal fasteners for the type SF box having a depth dimension greater than 18 in. (457 mm) shall be spaced not more than 2 2 in. (64 mm) apart center to center. The distance between the ends of the joint and the nearer end of the nearest fastener shall not exceed 1 in. (25 mm). Metal fasteners may be applied diagonally, vertically or horizontally at the option of the supplier.

#### **Weather-resistant and WWVR Boxes, Type CF and SF**

The lap joint shall be used on weather-resistant and WWVR grade boxes (fig 2-5). The lap joint will overlap either inside or outside the box not less than 1 1/2 inches, and will be secured with steel staple or steel stitching wire. The staples or stitches will be spaced not more than 2 inches apart, and the distance between the outer stitches and the end of the joint will not exceed 1 inch. An additional tie-stitch will be used about 1/4 to 3/4 inch from each end of the joint.

In lieu of a tie-stitch joint, boxes may be stapled or stitched with the same number of fasteners (including tie-stitches) equally spaced in a single row. When specified, the body joints of grades W5c, W6c, and V3c fiberboard boxes may be secured by the use of adhesive conforming to MMM-A-250.

#### **Butted Joint (Type CF Only)**

The butted joint shall be made by fitting the edges of the panels to be joined closely together and securing them with gummed tape. Tape used to secure the body joint of boxes having gross weight, of 40 lb (18 kg) or less (grade 125 to 175) shall be that normally used by the industry for this purpose.

Tape used to secure the joints of boxes having a gross weight of more than 40 lb (18 kg). (Grades over 175) shall be reinforced with sisal, cloth, glass, rayon or double strand nylon fibers. The tape shall be not less than 2 in. (51 mm) in width for boxes having a gross weight of 65 lb (30 kg) or less (grade 200 and below) and not less than 3 in (76 mm) in width for boxes having a gross weight over 65 lb (30 kg) (grade above 200). The tape shall be centered on the joint and extend its full length, or within 3/8 in (10 mm) or full length be centered on the joint and shall adhere over not less than 90% to the entire area of contact with the fiberboard.

### **Styles of Fiberboard Boxes**

The styles covered in figures 2-6, 2-7, and 2-8 are the basic styles of domestic, weather-resistant, and WWVR fiberboard boxes.

#### **RSC, Regular Slotted Box (figure 2-6)**

In this design, all the flaps (inner and outer) are of equal length. The outer flaps meet in the center when closed. This style is the most commonly used.

#### **SFF, Special Full Flap Slotted Box (figure 2-6)**

In this design the inner flaps meet in the center of the box. A one-fourth inch gap is permitted.

#### **FOL, Full Overlap Slotted Box (figure 2-6)**

In this design, the length of the outer flaps shall be not less than the inside width of the box minus 1 inch. This design results in a container with at least two thicknesses of fiberboard covering the entire top and bottom surfaces.

#### **OSC, Overlap Slotted Box (figure 2-6)**

In this box, when closed, the inner flaps must not overlap, and the outer flaps will overlap the distance specified in the order or invitation for bids. The inner flaps will be of the same length as the outer flaps, except when the relation of width to length would cause the inner flaps to overlap. In such a case, the inner flaps will be cut to meet in the center of the box.

#### **CSSC, Center Special Slotted Box (figure 2-7)**

This box is designed so that the inner and outer flaps meet in the center giving a double thickness for top and bottom.

#### **CSOSC, Center Special Overlap Slotted Box (figure 2-7)**

This box is designed the same as the CSSC except the outer flaps are the same length as the inner flaps and may overlap. No flap cutting is required.

#### **HSCC, Half Slotted Box With Cover (figure 2-7)**

This box consists of a box body and a cover. The body is formed from fiberboard, scored, slotted, and stitched to form a tube having four flaps of equal length, approximately half the width of the box, on the bottom only. Unless otherwise specified the cover shall be a Type I. When specified the cover shall be a Type II. The depth of the cover is 3 in. unless otherwise specified.

**DBLCC, Double Cover Box (figure 2-7)**

This box consists of a body tube and two covers. Unless otherwise specified Type I covers, three inches deep, are to be used.

**IC, Interlocking Double Cover Box (figure 2-7)**

This box consists of a body tube with top and bottom flanges and two interlocking covers. The body shall be SW or DW fiberboard, scored, slotted, and stitched to form a tube having double scored short flanges which form a lock with the flanges of the cover (fig 2-10). The top and bottom covers shall be secured with horizontal straps. Unless otherwise specified the flanges shall be 3 in. wide for boxes made with single-wall fiberboard and 4 in. wide for boxes made with double-wall fiberboard.

**FTC, Full Telescope Box (figure 2-8)**

The box consists of a body and a snug fitting cover. The flaps of both may be positioned in one of 3 possible combinations. This style of box, when closed, has a triple thickness of fiberboard on all four corners, affording good stacking strength.

Type CF (corrugated fiberboard) can be obtained in grades 3, 5, 6, 11, 13, and 15, with compliance symbols of V3c, W5c, W6c, V11c, V13c, and V15c. The small "c" indicates corrugated fiberboard.

**FTHS, Full Telescope Half Slotted Box (figure 2-8)**

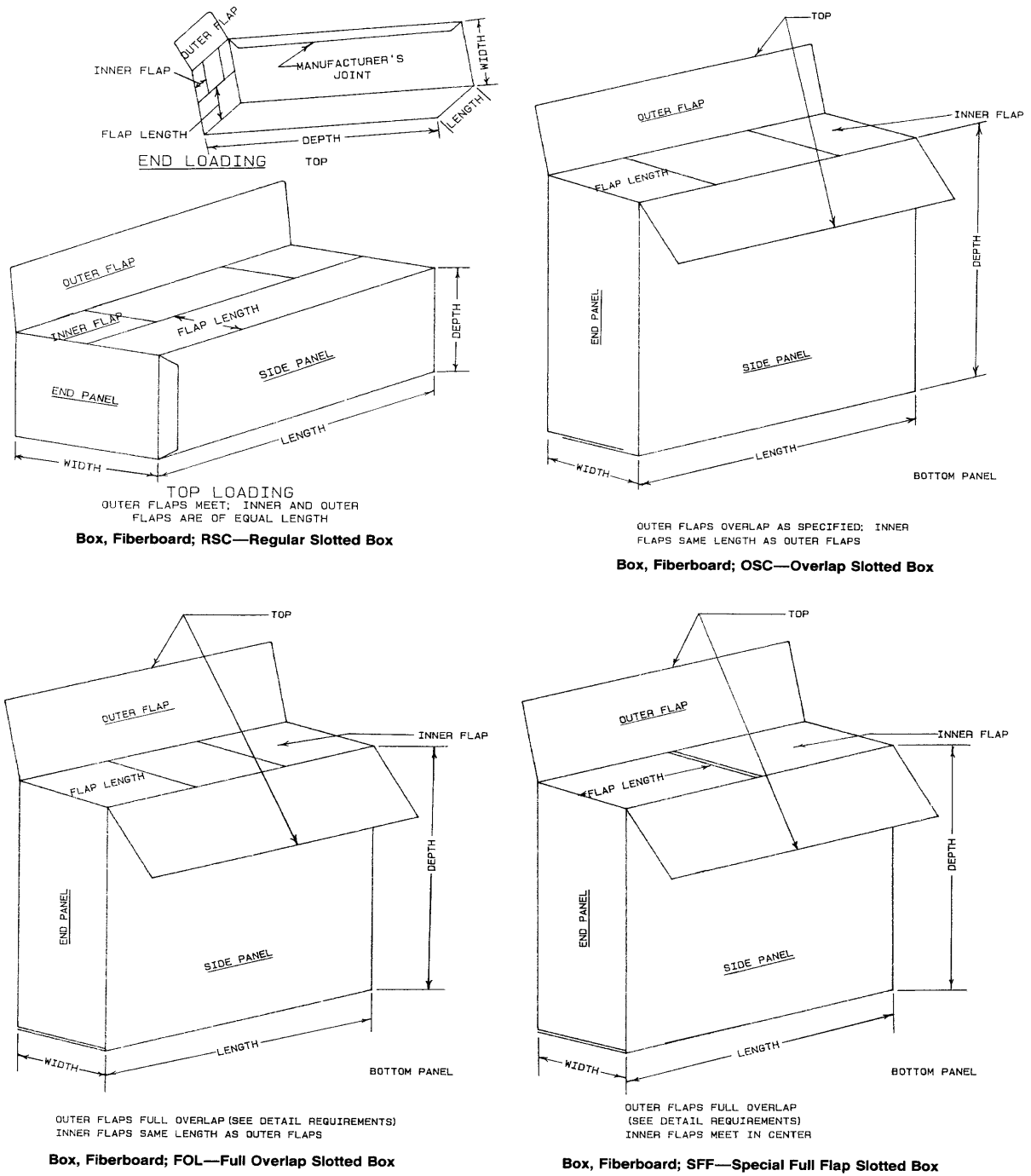
The box consists of a body and a telescoping cover, each constructed of one piece of scored and slotted fiberboard. The box dimensions shall be the inside measurements of the assembled box body. The cover shall be a snug fit on the body. The flaps along the longer edge of the box openings are the outer flaps and those along the shorter edge are the inner flaps. Flaps shall not project beyond an edge of the box. All flaps shall be of equal length with the outer flaps meeting in the center of the box but shall not overlap. A gap not to exceed 1/4 in. (6m.m.) will be permitted unless otherwise specified.

**OPF, One-Piece Folder Box (figure 2-8)**

When this box is closed, the outer flaps must meet. Unless otherwise specified, the inner flaps will not be less than 2 inches long for folders under 18 inches and over in width. this style is also known as a book wrapper.

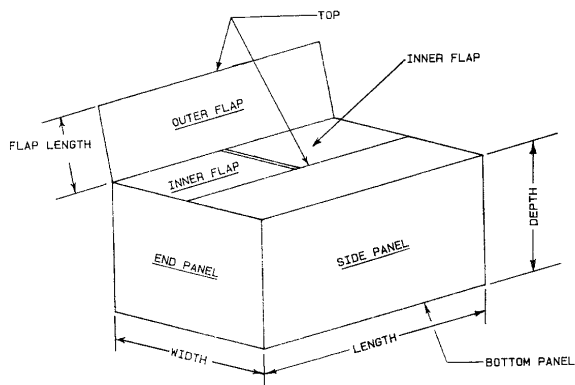
**TS, Triple-Slide Box (figure 2-9)**

This design, made from corrugated fiberboard only, is identified by the arrangement of corrugations in which all corrugations run at right angles to the score lines in all parts of the box. It consists of three slides, each of one piece of corrugated fiberboard, scored so as to cover completely four faces of the box. The joint of the inner slide will be left open. The middle slide will be taped at the body joint and will be a sliding fit on the assembled inner and middle slides.

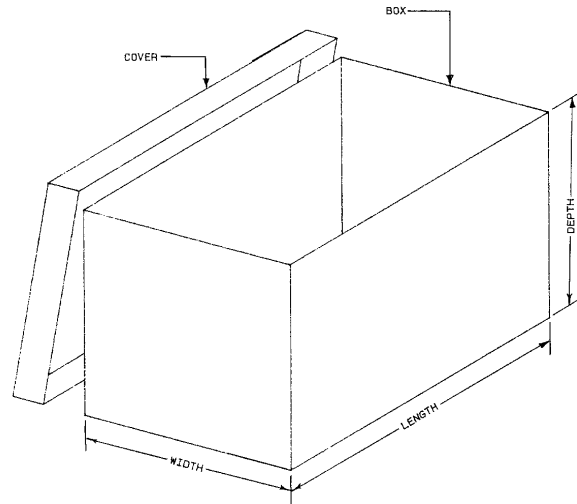


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Figure 2-6. Styles of fiberboard boxes.

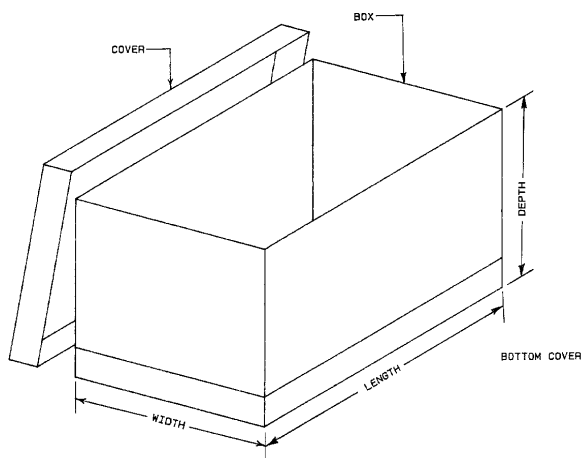


OUTER FLAPS MEET	CSSC
INNER FLAPS MEET	
OUTER FLAPS OVERLAP	CSOSC
AT RANDOM NO FLAP CUTTING	
INNER FLAPS MEET	

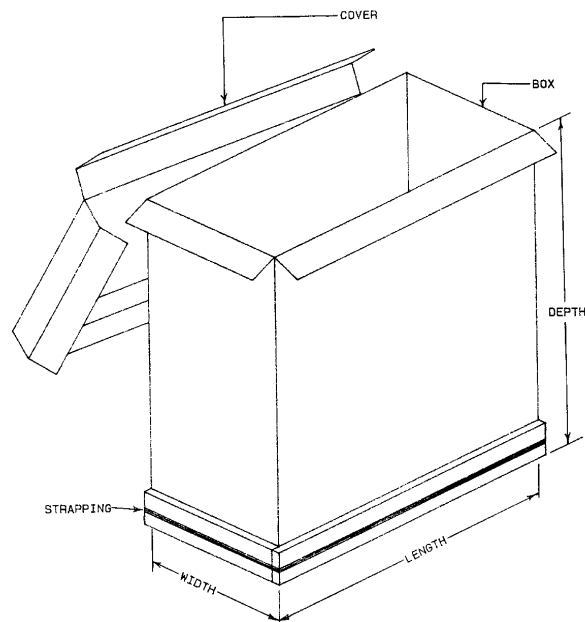


**Box, Fiberboard; HSCC—Half Slotted Box with Cover**

**Box, Fiberboard; CSSC—Center Special Slotted Box and CSOSC—Center Special Overlap Slotted Box**



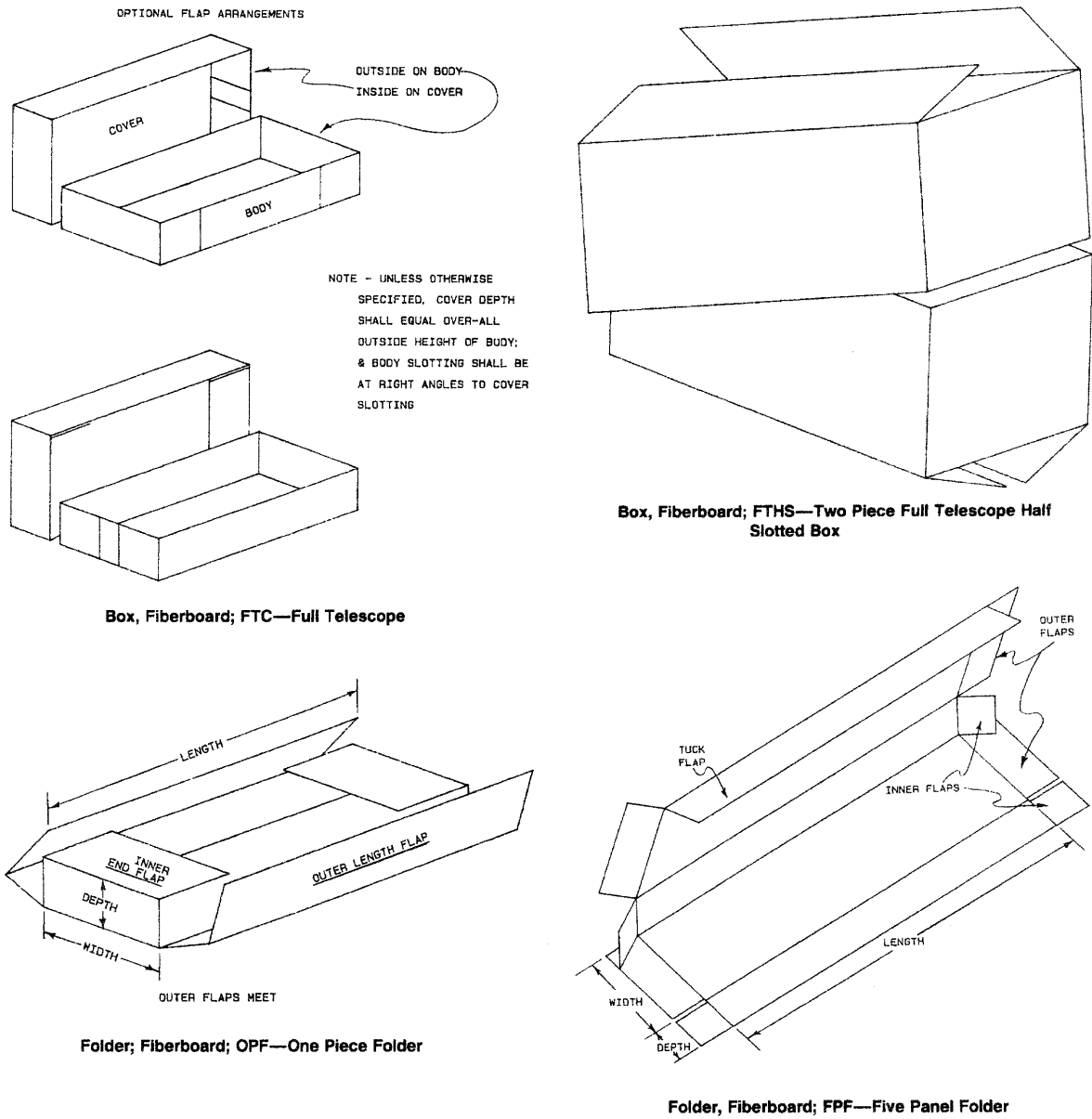
**Box, Fiberboard; DBLCC—Double Cover**



**Box, Fiberboard; IC—Interlocking Double Cover**

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Figure 2-7. Styles of fiberboard boxes.



SMPT 226

Figure 2-8. Styles of fiberboard boxes.



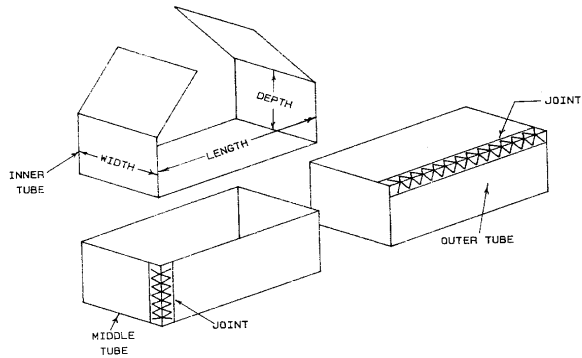


FIG. 13 Box, Fiberboard; TS—Triple Slide Box

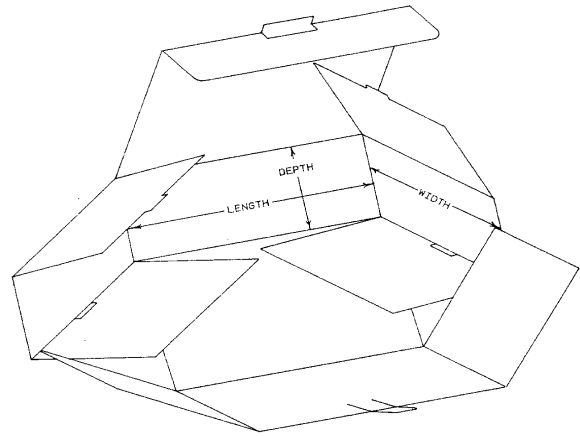
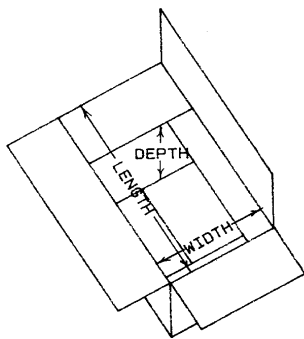
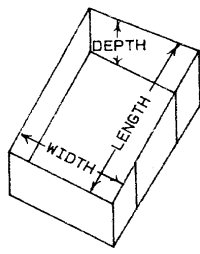


FIG. 14 Folder, Fiberboard; TSC—Tongue and Slot Closure



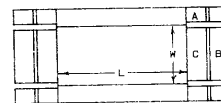
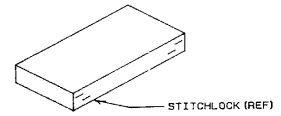
BOX BODY WITH FLAPS



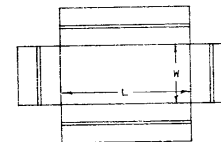
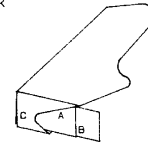
BOX BODY FOR FULL TELESCOPE CONTAINER



TYPE I STITCHLOCK



TYPE II FRICTION LOCK



TYPE III FLANGEINTERLOCK

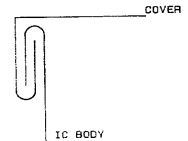
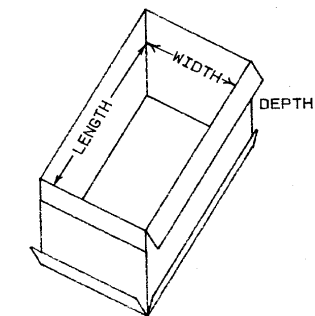
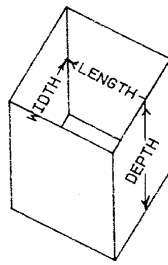


FIG. 16 Cover Assembly



BOX BODY FOR INTERLOCKING DOUBLE COVER



BOX: BODY

FIG. 15 Fiberboard Box Dimensioning

SMPT 3179

Figure 2-9. Styles of fiberboard boxes.

**FPF, Five Panel Folder Box (figure 2-8)**

This design consists of a single scored slotted sheet. When set up the outer end flaps will fully overlap. This box is used to an advantage in the packing of stacked or nested items which can be arranged on the flat scored sheet and when in position, the box is folded over the contents.

**TSC, Tongue and Slot Closure Box (figure 2-9)**

This box is constructed of one piece fiberboard, scored and slotted as shown.

**Sleeves (fig 2-11)**

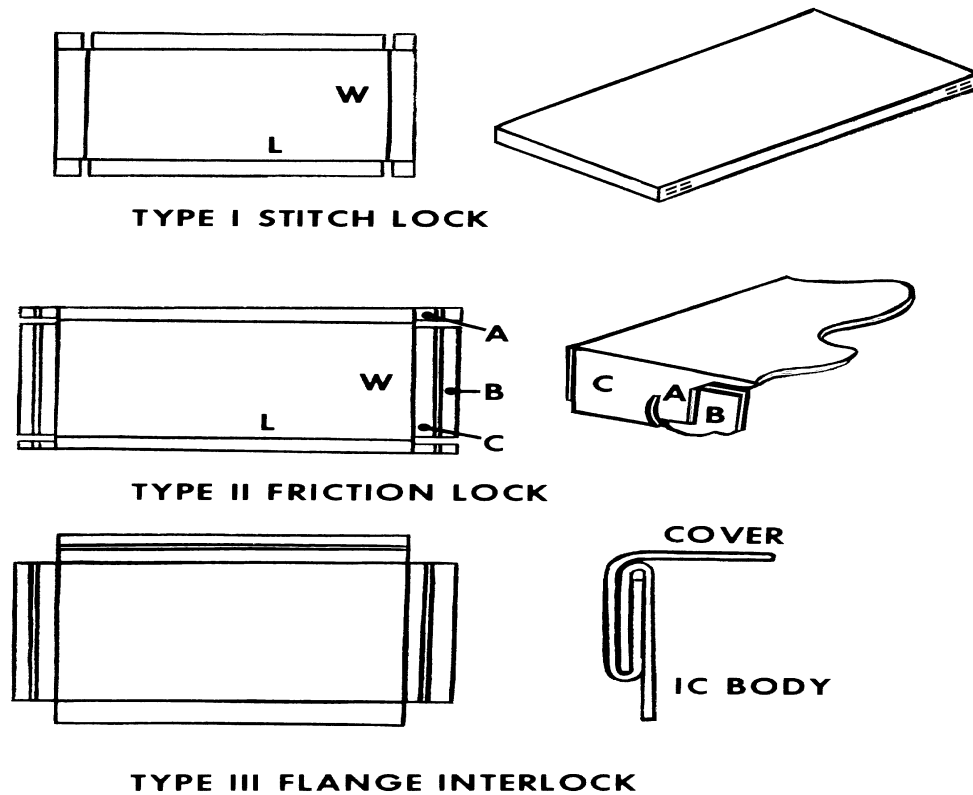
A sleeve may be specified for use with any of the box styles to provide added strength. Sleeves will be made from class weather-resistant fiberboard of the same type and grade as the box. A sleeve will closely fit the box over which it is placed and will cover the top and bottom, and both ends. The length of the sleeve (length of the stapled joint) will be the same as the inside width of the box. Unless otherwise specified, the corrugations will be at right angles to the score lines. If a butt joint is used it may be taped or the overlap joint may be stapled, stitched or glued. Alternatively, the location of the body joint shall be in the center of the top or bottom panel, providing the joint does not interfere with the required marking.

**Liners (Fig 2-12)**

Liners are made from one piece of fiberboard. They are scored to cover the end and side panels of the boxes. The height of the liners shall be the full inside depth of the boxes for which they are intended and the ends of the liners shall be about in the center of the side panels of the boxes.

Unless otherwise specified, liners for class domestic boxes shall be constructed for double-wall fiberboard, grade 275. The joints shall be secured with minimum 2 inch wide tape conforming to A-A-1492, A-A-1671. Liners shall be constructed from the same class of material as the boxes themselves.

Unless otherwise specified liners for class weather-resistant boxes shall be constructed of V15c fiberboard. When specified grade W5c, W6c, V3c, or V13c shall be used. Liners fabricated from single-wall fiberboard shall be A or C flute and liners fabricated from double-wall fiberboard shall be any combination of A, B, or C flutes, except BB flutes shall not be used. The flutes shall be perpendicular to the box openings (as shown in fig 2-12). The joints shall be secured with minimum 2-inch wide tape running not less than three quarters the length of the joint.



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Figure 2-10. Cover assemblies.

**BOX MAKER'S CERTIFICATE (FIG 2-13)**

Each fiberboard box will be plainly marked with the box maker's certificate, signifying compliance with the requirements of the applicable freight classification rules. Type CF and type SF, class domestic boxes are not required to be marked as being in compliance with ASTMs. There is no objection to marking boxes that are manufactured in compliance with the specification. Types CF and SF, class weather-resistant boxes, in addition to the box maker's name, will be marked with the date of manufacture expressed in month and year, such as 7-93; the identification symbol, such as V3s; and the specification compliance data and the minimum average bursting strength guaranteed in excess of...PSI. The figure to be inserted should be that corresponding to the dry mullen requirements in ASTM D 4727 for the particular grade of fiberboard used. For shipments to Government agencies include the national stock number (NSN), inside dimensions and outside cube marked below the specification data on all exterior boxes procured as an item of supply.

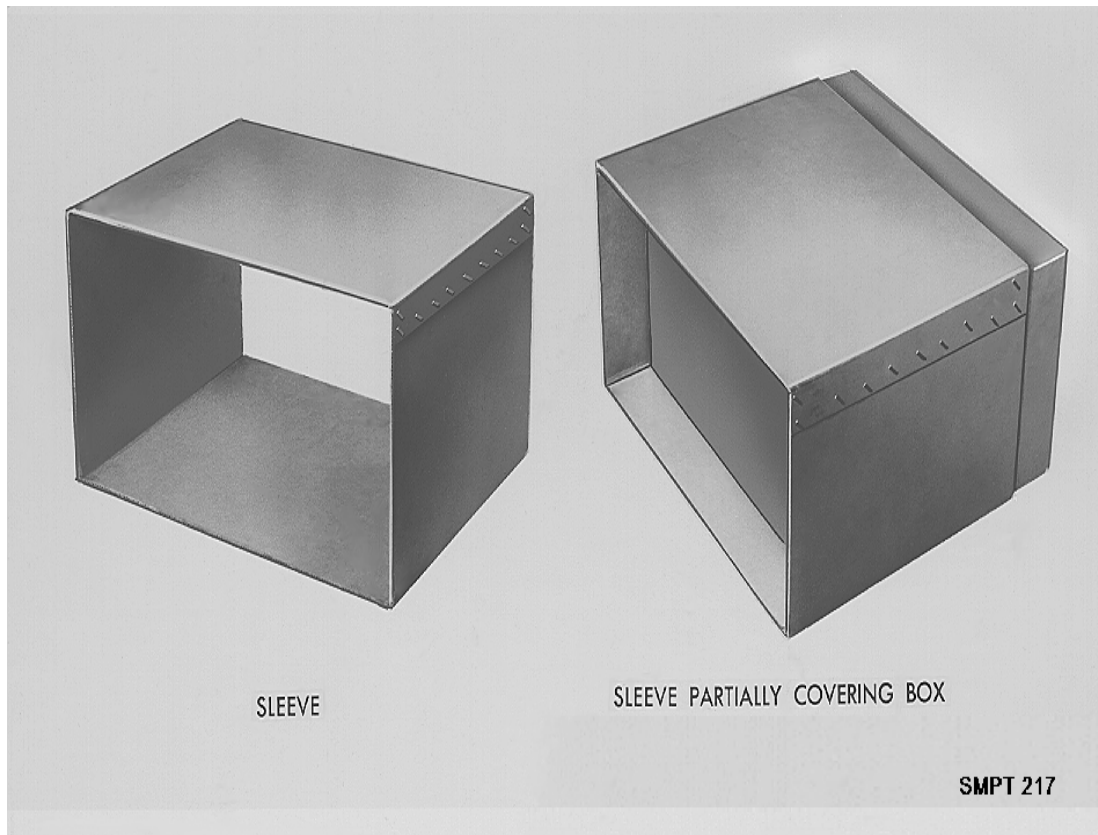


Figure 2-11. Use of fiberboard sleeve.

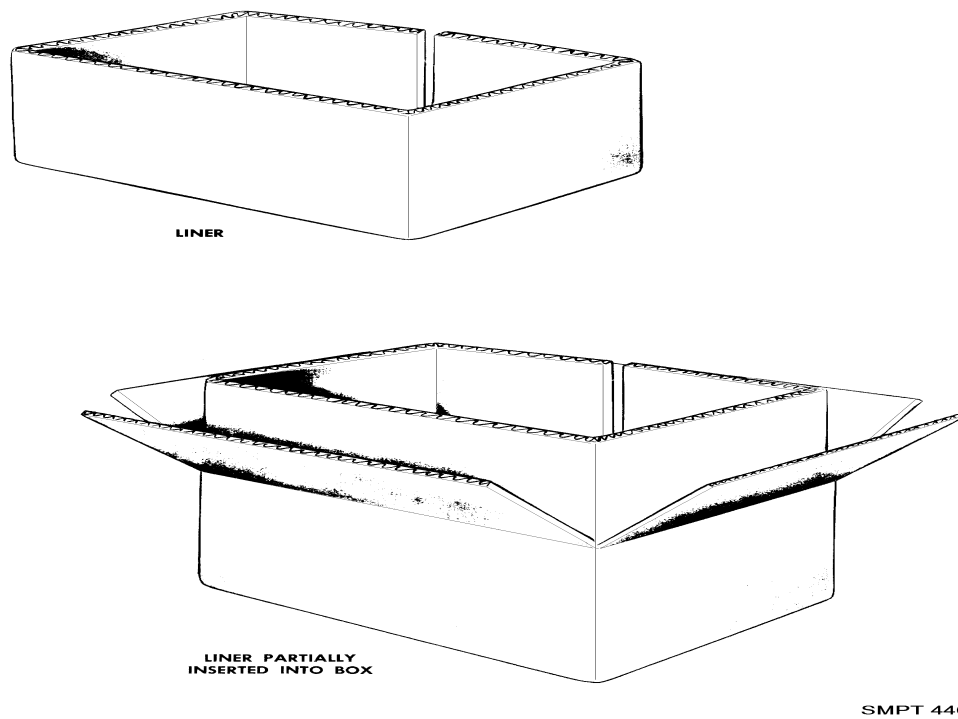
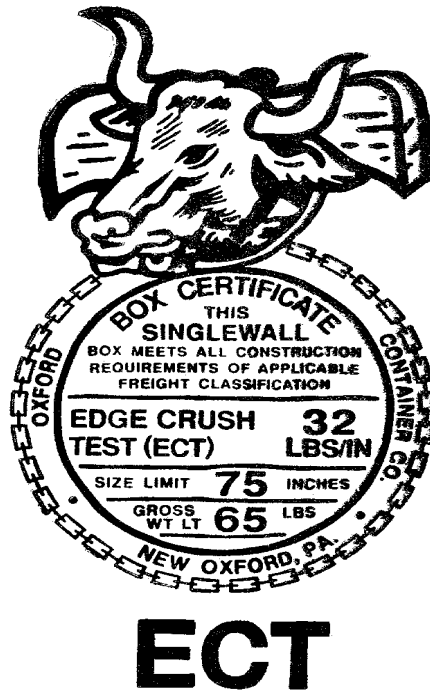


Figure 2-12. Use of fiberboard liner.



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Figure 2-13. Sample of box maker's certificate.

### Closure Requirements

All boxes should be securely closed. Inner and outer flaps of slotted style boxes should be drawn together as closely as possible to insure proper closure. The lengthwise flaps should meet on (RSC, CSSC, DSC) or overlap on (OSC, CSOSC, FOL, SFF), as specified. The flaps should not project over the side or end edges, and the application of adhesive or metal stitches should be such as to prevent lifting of free edges and corners of outer flaps on assembled boxes. ASTM D 1974, standard practice for methods of closing, sealing, and reinforcing fiberboard shipping containers describes several methods to close seal and reinforce solid and corrugated (excluding triple wall) fiberboard.

Solid and corrugated fiberboard (excluding triple wall) boxes will use the methods for closure, sealing, and reinforcing which are described in ASTM D 1974, Standard Practice for Methods of Closing, Sealing and Reinforcing Fiberboard Shipping Containers. The ASTM lists, by box style, the appropriate closure method use of adhesives, tape, stitches/staples. For each method listed, details concerning the amount of adhesive required, or the type and size of tape used, or the number pattern of stitches/staples for that method are indicated. For example, to close a 12" wide (inside width) RSC container for government use, using stitches/staples, ASTM D 1974 indicates a closure method 2D3 may be used. The staples must have a 1/2" crown and be evenly distributed where the inner and outer flaps overlay each other. The number of 1/2" staples required to close the container is taken from the ASTM D 1974 table one referenced in the 2D3 method. (See table 2-7). The left column of the ASTM D 1974 table indicates the inside width of the box - in our example 12". Read to the right from our box width until it intersects with the column for closure method 2D3. Ten 1/2" staples or fasteners are

required for each end of the box. The pattern required for even distribution per closure method 2D3 is indicated in figure 2-14. Figures 2-15 through 2-19 provide examples of the closure methods for fiberboard boxes.

There are four methods of box sealing, Methods A through D (fig 2-19). They are described in section 7 of ASTM D 1974. Within each sealing method, the type of material authorized, its size, and its location on the box are specified.

#### Application of reinforcement (figure 2-20)

When only one band is required on a box in given direction, it shall be centered except in the case of lengthwise bands on styles RSC and CSSC boxes. On these styles the lengthwise band shall be offset slightly from the seam formed by the top and bottom flaps in the closed position. When two or more bands are used around the box in the same direction they shall divide the box into units of equal length. Cross banded boxes shall have the longer band applied first. Boxes carrying loads having restricted points of contact shall be banded, wherever practicable, over these points of contact. Bands shall be applied straight and shall be sufficiently tensioned. Metal bands shall be embedded into the edges of the box, but shall not cut or tear the fiberboard or crush the contents. When a sleeve is specified the bands shall be applied after the sleeve is placed on the box.

Metallic and nonmetallic strapping requirements are listed in table 2-8. The required number of reinforcing bands are identified in table 2-9.

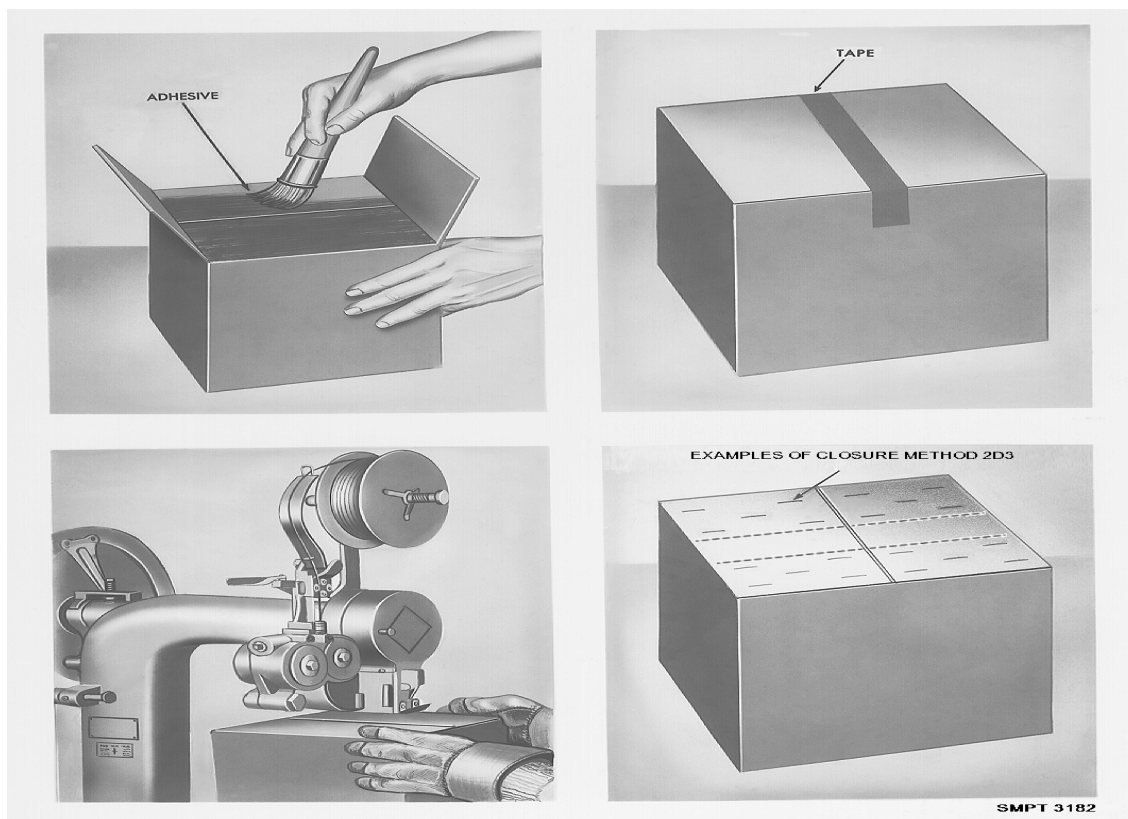


Figure 2-14. Closure of class weather-resistant and WWVR fiberboard boxes with adhesive and/or stitches.

Table 2-7 Number of 2 in. Crown Staples or Stitches for Regular Slotted Containers

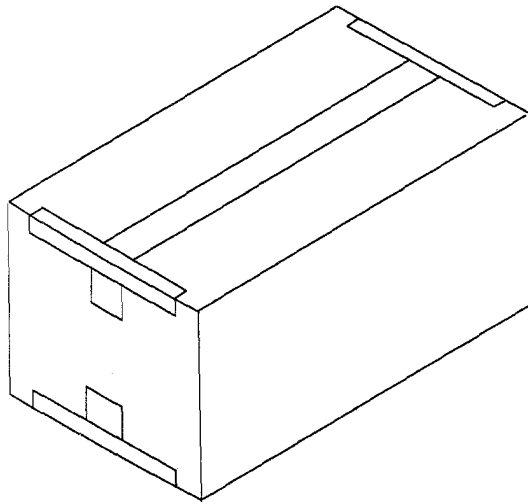
Inside Width of Box in <sup>A</sup>	Number of Fasteners at Each End of Box, by Method		
	2D1, Commercial, Fig 5	2S2, Rule 41, Fig. 6	2D3 Government, Fig 7
6	2	2	6
7	2	4	6
9	4	6	6
10	4	6	8
11	4	6	8
12	4	8	10
14	6	10	12
16	6	10	14
17	6	12	14
18	6	12	16
19	8	14	16
20	8	14	18
22	8	16	20
24	10	16	22

<sup>A</sup> One inch = 25.4 mm

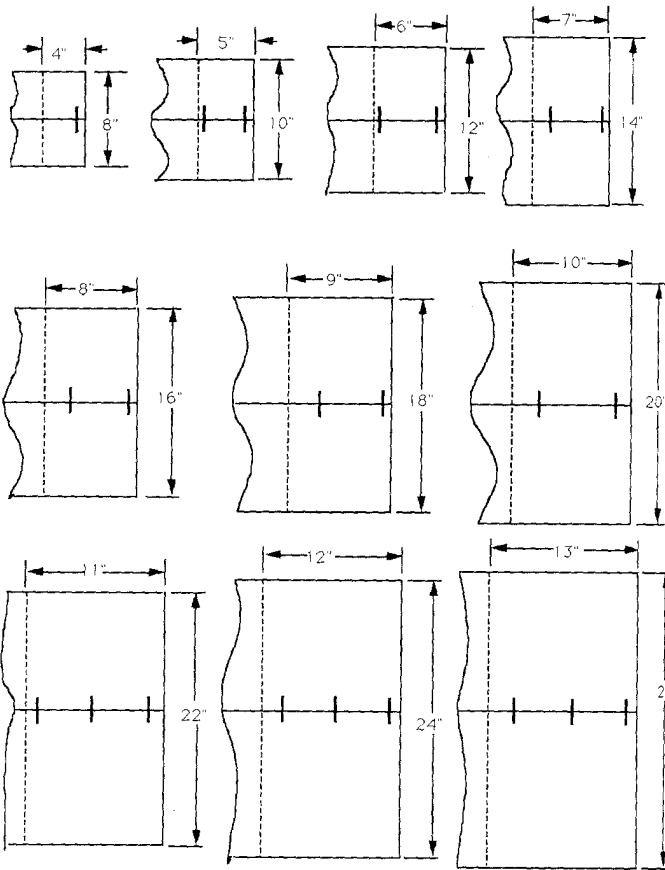
Number of Wide Crown Staples or Stitches for Regular Slotted Containers

Inside Width of Box in <sup>A</sup>	Number of Fasteners at Each End of Box, by Method		
	2D4, Commercial, Fig 8	2D5, Old Rule 41, Fig 9	2D6, Government, Fig 10
8	1	1	4
10	2	2	5
12	2	2	6
14	2	2	8
16	2	4	9
18	2	4	10
20	2	4	11
22	3	5	12
24	3	5	14
26	3	5	15

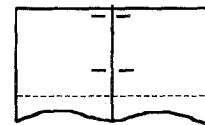
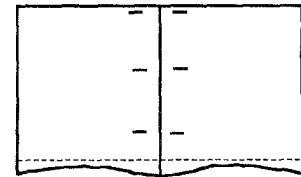
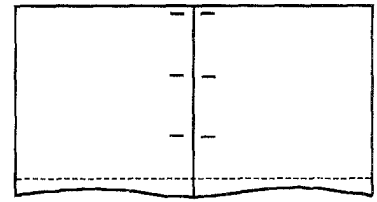
<sup>A</sup> One inch = 25.4 mm



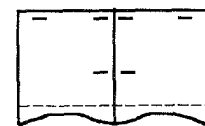
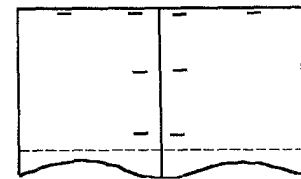
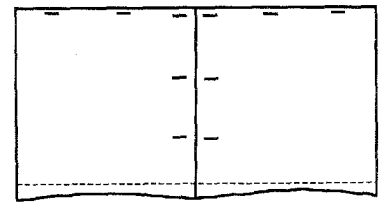
Example of Closure Method 2B7



Example of Closure Method 2D4



Example of Closure Method 2D1

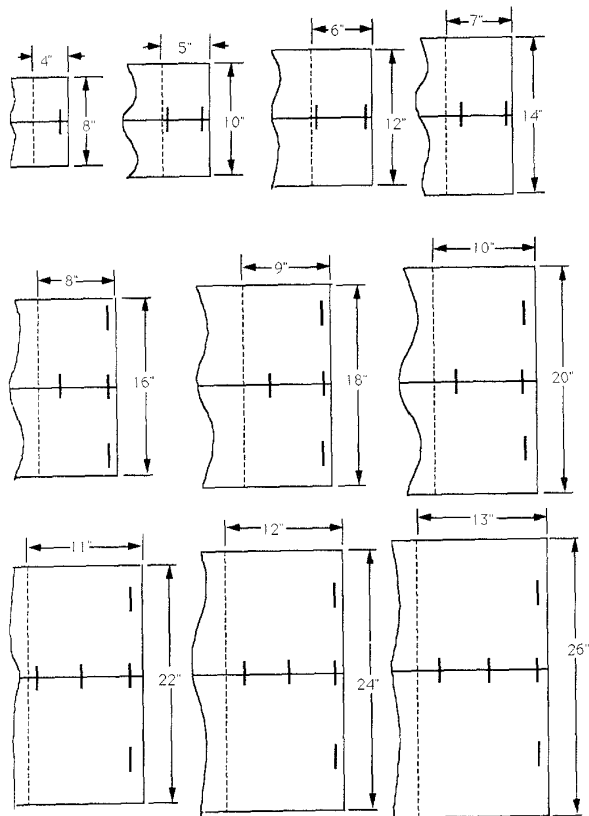


Example of Closure Method 2D2

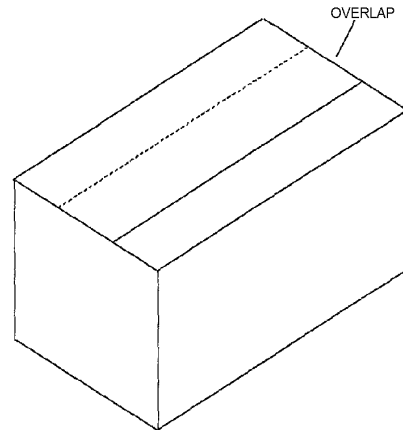
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Figure 2-15. Closure methods of fiberboard boxes.

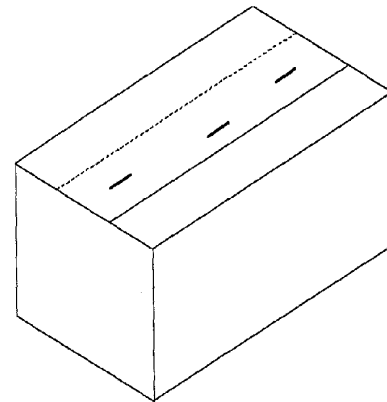




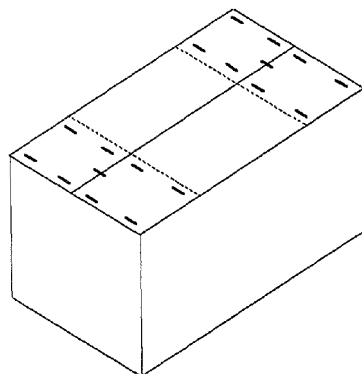
Example of Closure Method 2D5



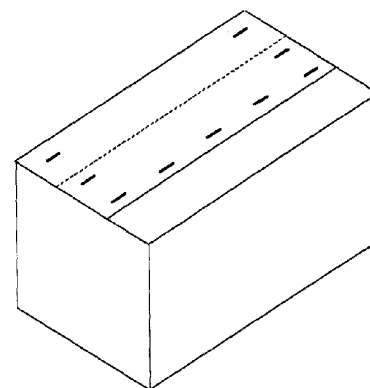
Example of Closure Method 3A1 and 3A2



Example of Closure Method 3D1



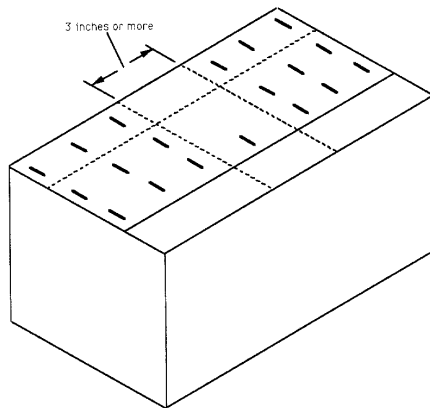
Example of Closure Method 2D6



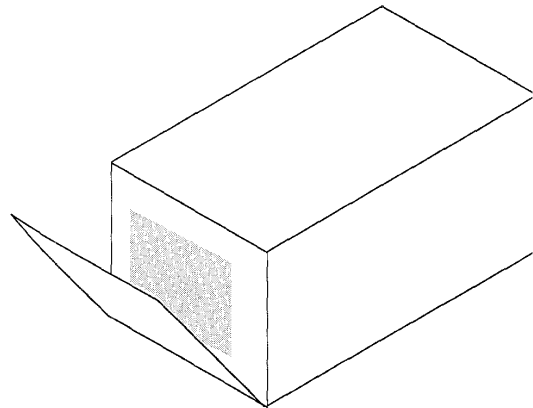
Example of Closure Methods 3D2, 3D3, and 3D4

SMPT 3184

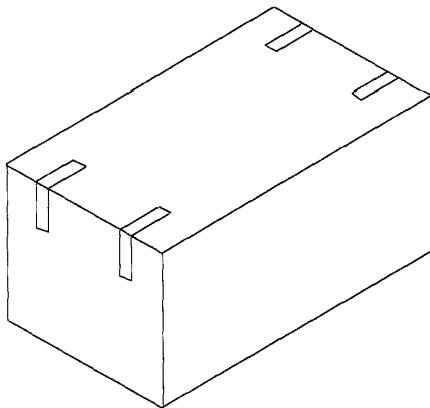
Figure 2-16. Closure methods for fiberboard boxes.



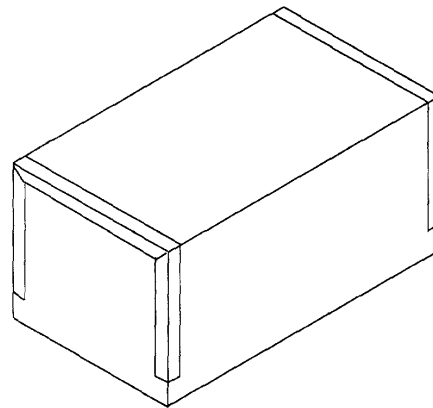
Example of Closure Method 3D5



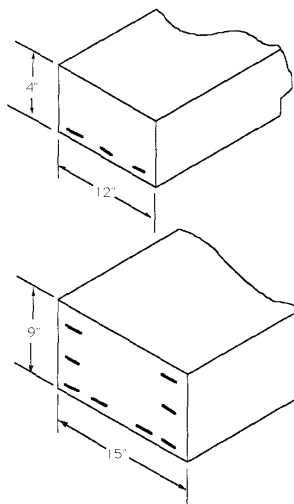
Example of Closure Methods 4A1 and 4A2



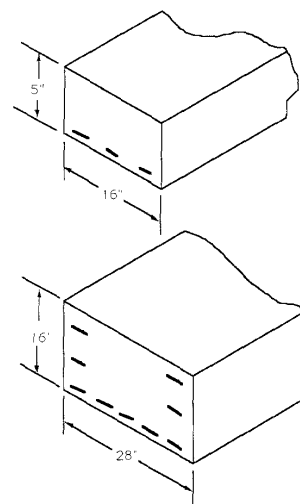
Example of Closure Methods 4B3, 4B4, 4B5, and 4C2



Example of Closure Methods 4B1, 4B2, and 4C1



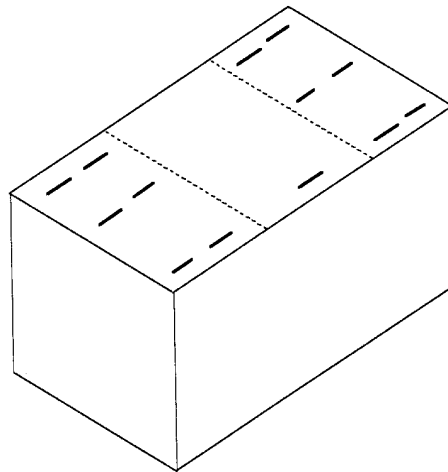
Example of Closure Methods 4D1 and 4D2



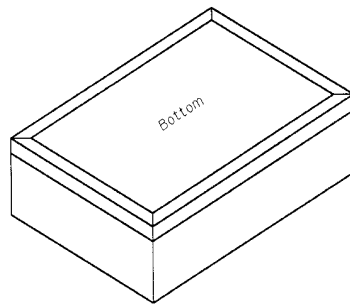
Example of Closure Methods 4D3 and 4D4

SMPT 3185

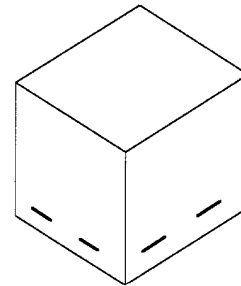
Figure 2-17. Closure methods for fiberboard boxes.



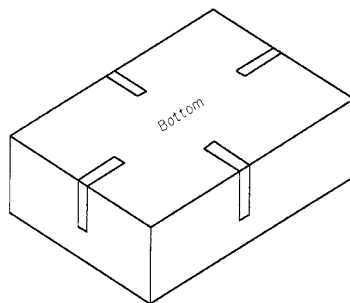
Example of Closure Method 4D5



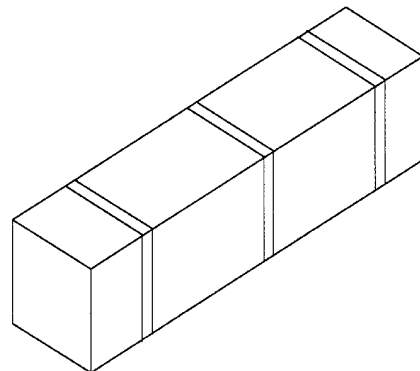
Example of Closure Methods 5A1, 5A2, and 5B1



Example of Closure Methods 5C1 and 5C2



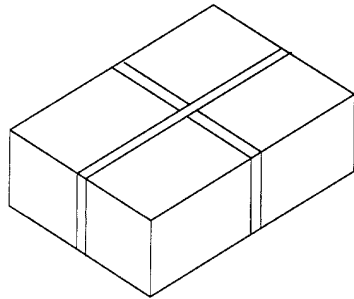
Example of Closure Methods 5A3, 5A4, 5A5, and 5B2



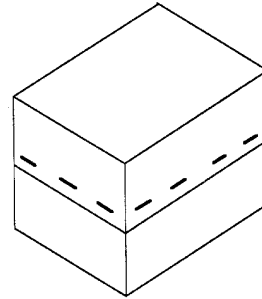
Example of Closure Method 6D2 and Reinforcement  
Methods 2A and 2B

SMPT 3186

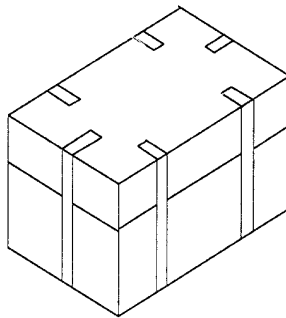
Figure 2-18. Closure methods of fiberboard boxes.



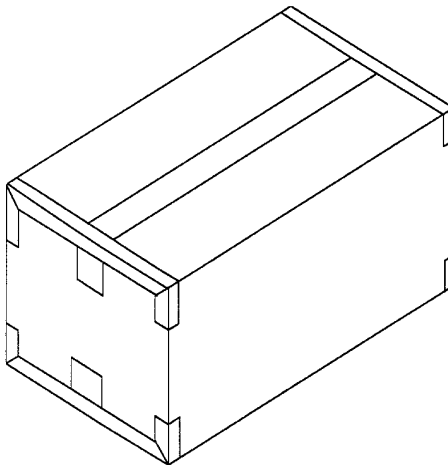
Example of Closure Method 6D3



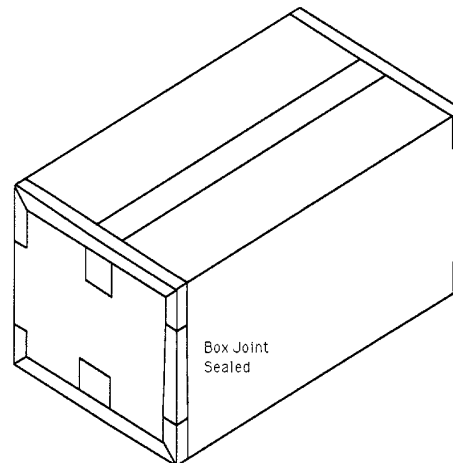
Example of Closure Methods 6C1 and 6C2



Example of Closure Methods 6B1, 6A2, and 6A1



Example of Sealing Method A



Example of Sealing Methods B, C, and D

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Figure 2-19. Closure methods of fiberboard boxes.

Table 2-8. Metallic and nonmetallic strapping requirements. IAW ASTM D 4675.

Gross weight of container and contents	ASTM D3953/ ASTM D4675	ASTM D3950 Nonmetallic B		ASTM D3853 Zinc Galvanized	
(Pounds)	Type I	Type II	Type III	Grade 1	Grade 2
Up to 35	1/4 x 0.015 5/16 x 0.012 5/8 x 0.010	3/8 x 0.015 3/8 x 0.018 or 1/4 x 0.025 or 0.027	7/16 x 0.017 1/2 x 0.015	16-1/2	16-1/2
Over 35 to 70, incl.	3/8 x 0.015 A/	3/8 x 0.015 3/8 x 0.024 or 1/4 x 0.025 or 0.027 or 7/16 x 0.025	7/16 x 0.017 1/2 x 0.015	16	15
Over 70 to 110, incl.	3/8 x 0.020 1/2 x 0.015	1/2 x 0.015 3/8 x 0.020 7/16 x 0.025 or 1/2 x 0.022	1/2 x 0.015 7/16 x 0.017	14	13
Over 110 to 225 incl.	1/2 x 0.020 5/8 x 0.015	1/2 x 0.020 5/8 x 0.015 7/16 x 0.025	7/16 x 0.023 1/2 x 0.020	13	

A Size 1/4 by 0.015 in strap may be used for Type 1 loads and FTC boxes of frozen foods.

B/ Other type and sizes may be applicable.

Table 2-9. Required number of reinforcing bands

Direction of bands <sup>1</sup>					
Lengthwise		Girthwise		Horizontal <sup>2</sup>	
Outside width of box	Number of bands (min) <sup>3</sup>	Outside length of box	Number of bands (min) <sup>3</sup>	Outside depth of box	Number of bands (min) <sup>3</sup>
<i>Inches</i>		<i>Inches</i>		<i>Inches</i>	
Up to 9.....	None	Up to 20	1	Up to 18	None
Over 9 to 18.....	1	20 to 30, incl.	2	18 to 30, incl.	1
Over 18 to 30.....	2	Over 30 to 48	3	Over 30 to 48	2
Over 30 to 48.....	3	Over 48 to 60	4		
Over 48.....		Over 60 <sup>4</sup>		Over 48 <sup>4</sup>	

<sup>1</sup> Lengthwise--Encircling top, bottom, and ends, Girthwise--Encircling top, bottom, and sides. Horizontal--Encircling sides and ends.

*Note* that the location of the openings determines the designation of the panels, rather than normal storage position.

<sup>2</sup> Horizontal bands are only occasionally required. where contents exert severe pressure on vertical score lines, they should be used.

<sup>3</sup> Full telescope-style boxes, having corners not otherwise sealed to bodies, will usually require use of one or more additional bands, both lengthwise and girthwise when dimensions approach the upper range of the size brackets listed in above table. Additional bands, when required, will be specified by the procuring agency.

<sup>4</sup> As directed by the procuring agency.

#### NOTE

Reinforcement may be omitted from class weather-resistant boxes containing non-perishable subsistence items and clothing which are to be palletized or containerized. An exception to this is nonperishable subsistence materiel consigned to the Naval Supply Center at Norfolk and Oakland for subsequent transfer at sea.

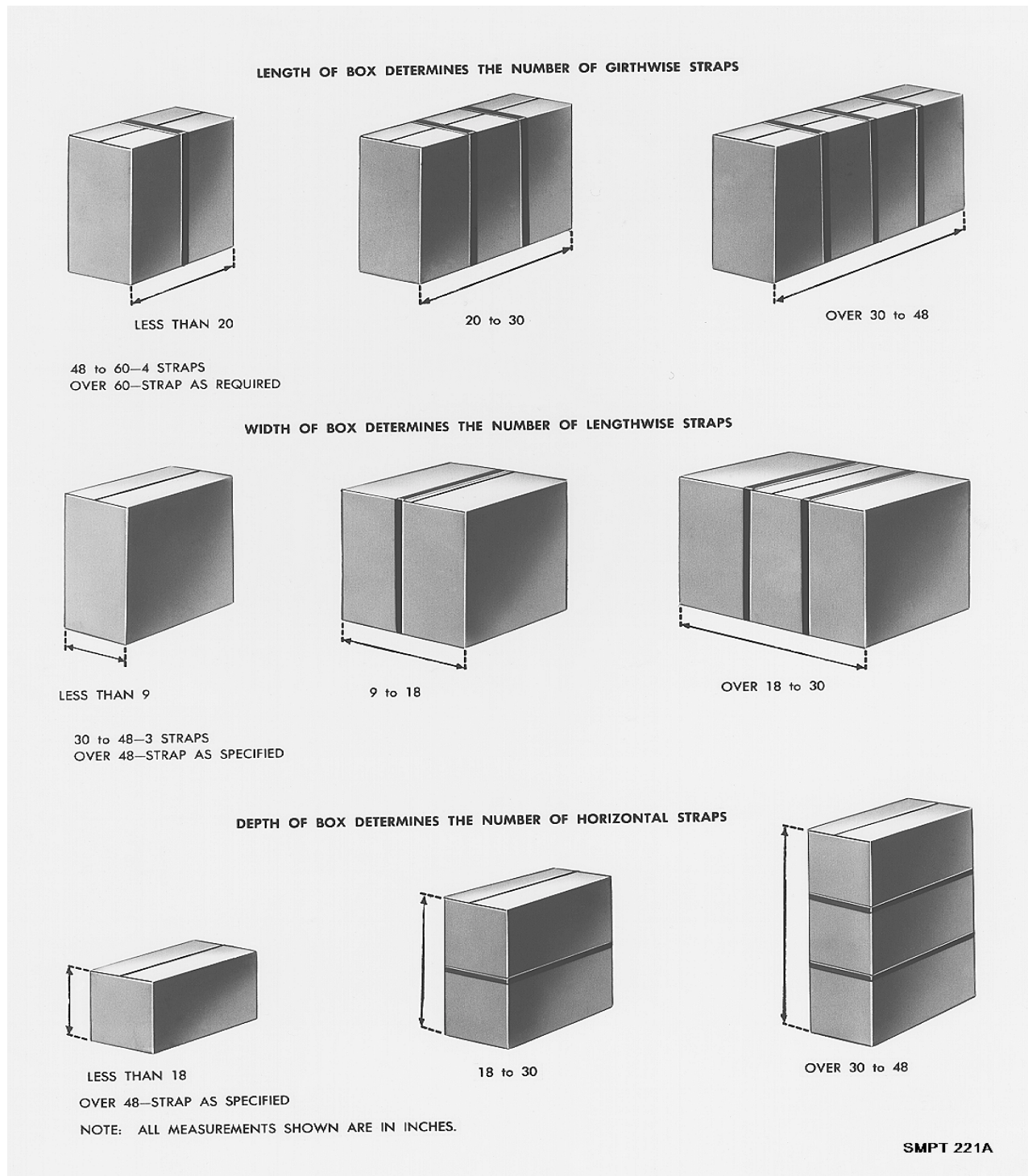


Figure 2-20. Strapping of fiberboard boxes.

### **Reuse and Conservation of Fiberboard Boxes**

It is important that attention be given to the reuse and conservation of fiberboard boxes. This must be looked upon from an economical standpoint. If care is used in opening incoming fiberboard boxes, some of them may be reused as interior intermediate containers, but never as exterior shipping containers, with the exception of good V-board boxes. The condition of the box is a big factor in its reuse. No box that has been cut, torn, pierced, or damaged by water or moisture should be reused. If used, V-board boxes are included in this category, they may be reused for domestic shipments. Used boxes shall have all old markings pertaining to previous shipments obliterated before reuse as interior or exterior containers. If the whole boxes cannot be reused, consideration should be given to the use of clean, sound fiberboard as material for one of the following applications:

Fabrication of blocking and bracing. Blocking and bracing are used to prevent movement of the item within the container, contact of items among themselves (when more than one is packed in a shipping container), or contact of an item with the faces of the container.

Fabrication of die-cuts, cells, trays, pads, etc., for cushioning purposes.  
Triple-wall Corrugated Fiberboard Boxes (ASTM D 5168)

## **TRIPLE-WALL CORRUGATED FIBERBOARD BOXES (ASTM D 5168)**

### **DESCRIPTION AND CHARACTERISTICS**

A triple-wall corrugated fiberboard box is a container made of triple-wall corrugated fiberboard in accordance with ASTM D 5168. Triple-wall corrugated fiberboard consists of three corrugated sheets laminated to four flat facings (fig. 2-3) resulting in a thick, relatively sturdy structural material. Boxes made of this material have the following characteristics:

- They are especially suited for difficult, heavy loads that require exceptionally large containers.
- They are extremely resistant to sudden forces such as those encountered when the box is dropped.
- They have a high resistance to compression and can sustain heavy loads for long periods of time.
- They are lighter in weight and smaller in cube than wooden containers made for the same items.
- They have certain inherent cushioning characteristics due to the corrugated stock from which they are made.

The fire-retardant requirements of boxes are intended to reduce losses due to fire destruction.

Classes and Styles. Triple-wall, corrugated fiberboard boxes are furnished in the following classes, styles, and types of ends:

Nonweather resistant.  
Weather resistant.  
Fire-retardant.

Style A - One-piece fiberboard, five-panel, with one of four types of ends, and with ends inserted in box body (fig 2-21).

Style B - One-piece fiberboard, five-panel, with one of four types of ends, and with ends inserted in box body overlapped on box ends (fig 2-21).

Style C - Two-piece fiberboard, three-panel, with one of four types of ends, and with ends inserted in box body overlapped on the box ends (fig 2-21).

Style D - Two-piece fiberboard, three-panel, with one of four types of ends, and with ends inserted with outside edges of the box body overlapped on box ends (fig 2-22).

Style E - A regular slotted fiberboard box conforming to style RSC ASTM D 5118. The body (manufacturer's) joint should be 2 inches wide, crushed, and stapled on a slant not more than 1 inch apart (fig 2-22). The corrugations of that portion of the side panel in which the body joints overlap shall also be crushed. Style E boxes may also be made with a 1 1/2-inch crushed overlap on the top and bottom panel of the box. This is called an alternate style E box.

Style F - A full telescopic fiberboard box, consisting of a body and a cover each of one-piece slotted and scored triple-wall fiberboard. The inside depth of the cover shall be the overall depth of the body (fig 2-22).

Style G - Half regular slotted box with short top flaps and cover. Style G box is similar to style F, except that all the top flaps are 4 inches long and are crushed-rolled 1 1/2-inches at the edges. A cover, at least 6 inches deep, forms the top of the container. The cover may be constructed so that the end and side flanges form a butt joint at each of the four corners (fig 2-23), or it may be made with end or side flaps which are stapled to the adjacent flange of the top.

## Wood Ends

There are four types of wood or wood-cleated panel ends that can be used with styles A, B, C, and D triple-wall, corrugated fiberboard boxes. The wood used to fabricate the ends must conform to wood groups I and II as set forth in PPP-B-621. The ends are of the following designs (fig 2-24).

Number 1 end--A single piece of nominal 2-inch lumber.

Number 2 end--Two thicknesses of nominal 1-inch lumber with the grain at right angles, the two thicknesses securely joined by clinched nails, and no piece less than 2 1/2 inches in width.

Number 3 end--Nominal 1-inch material with a nominal 1-inch thick cleat minimum width of 2 1/4 inches, securely joined by clinched nailing.

Number 4 end--Cleated panel ends consisting of two sets of overlapped cleats with a panel of triple-wall corrugated fiberboard. The cleats shall be nominal 1-inch thick, 2 1/4 inches wide, and shall be assembled with clinched nailing. The fiberboard shall be fastened to the inside of the cleats with either nails or staples.



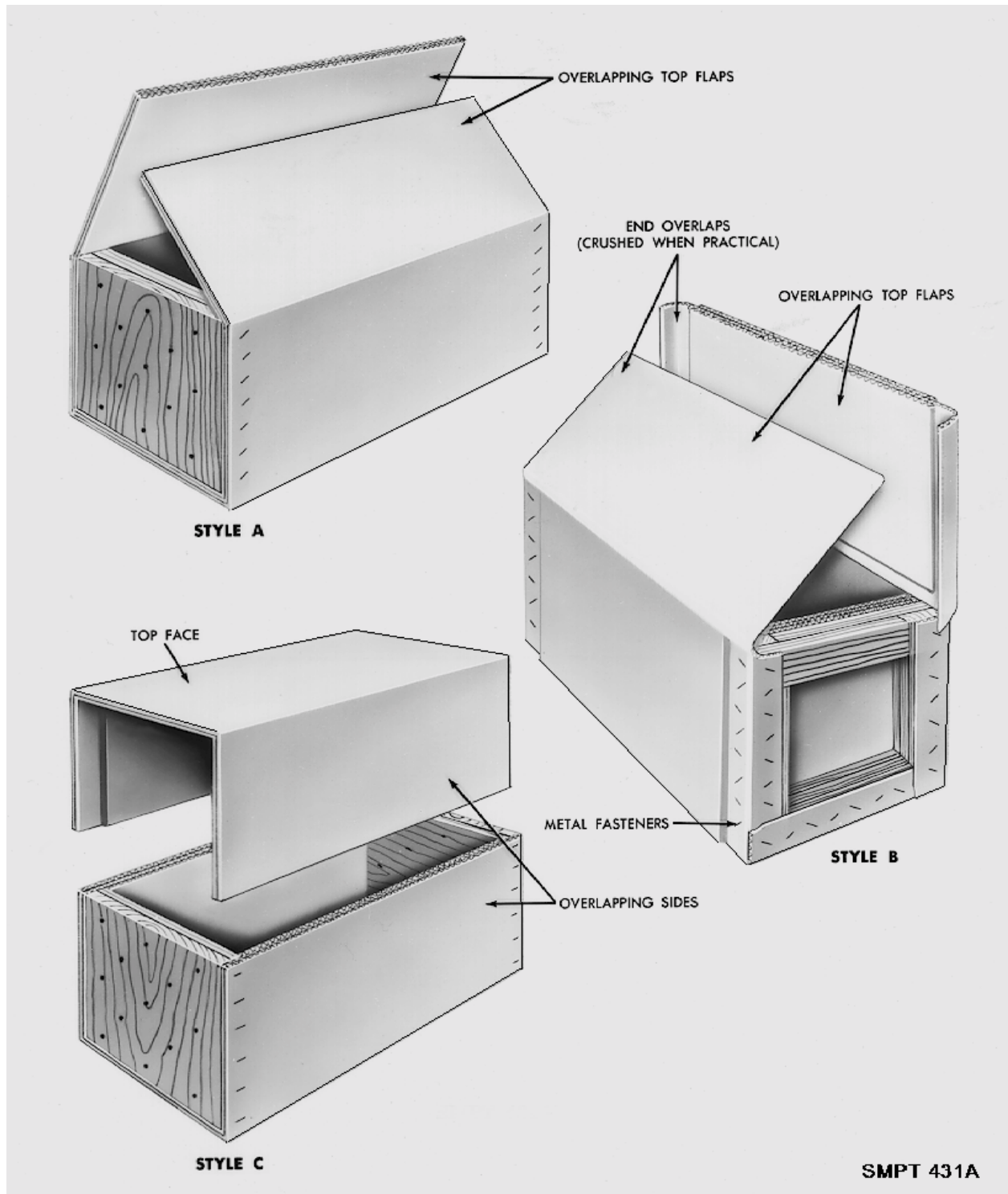
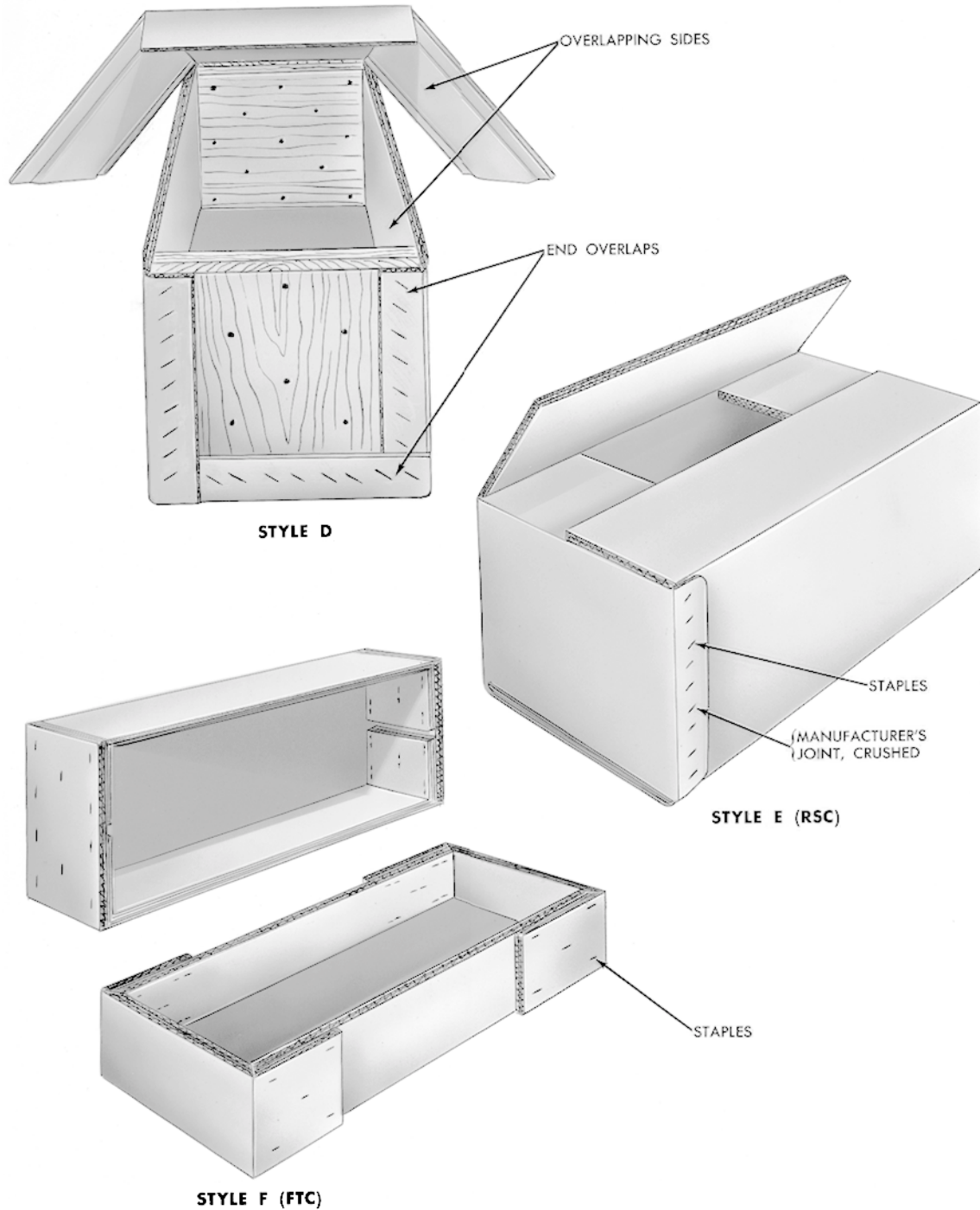


Figure 2-21. Styles A, B and C triple-wall corrugated fiberboard boxes.



STYLES D, E, AND F TRIPLE WALL BOXES

SMPT 432A

Figure 2-22. Styles D, E, and F, triple-wall corrugated fiberboard boxes.

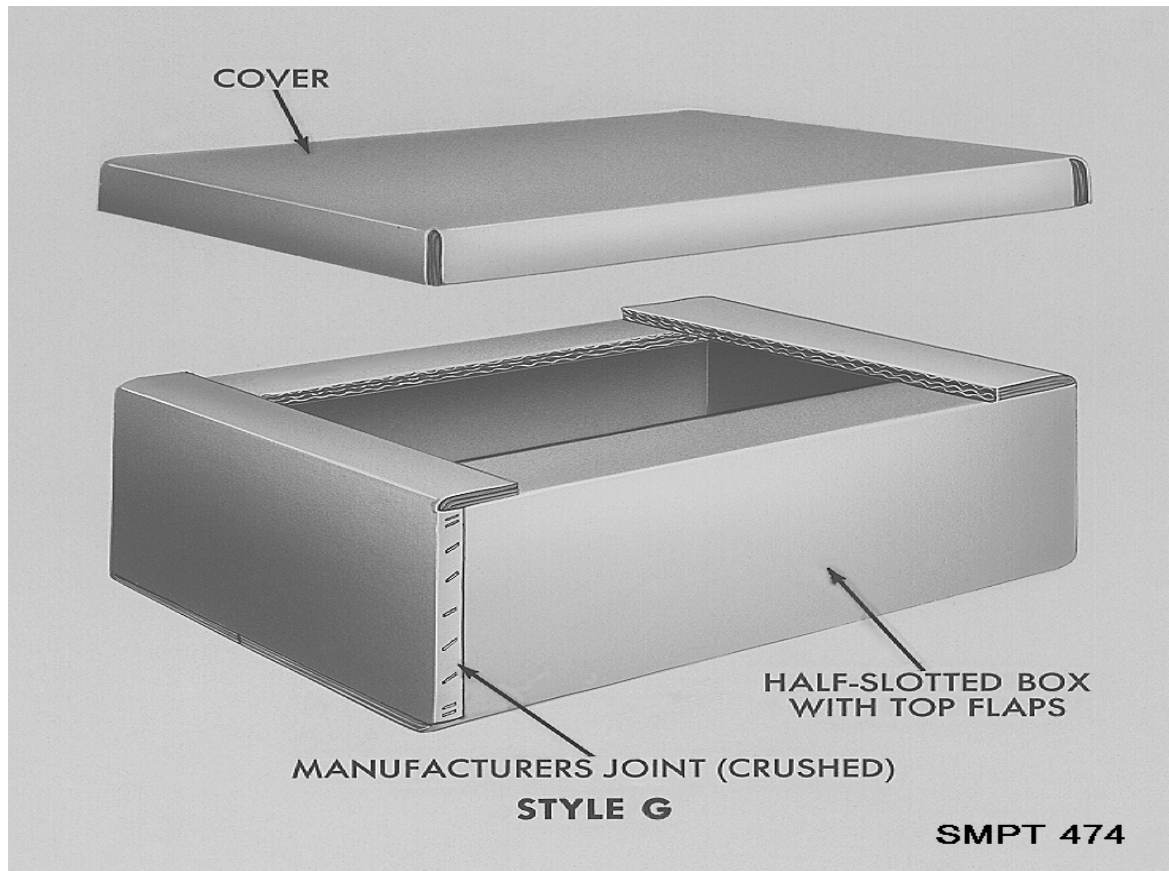


Figure 2-23. Style G triple-wall corrugated fiberboard box.

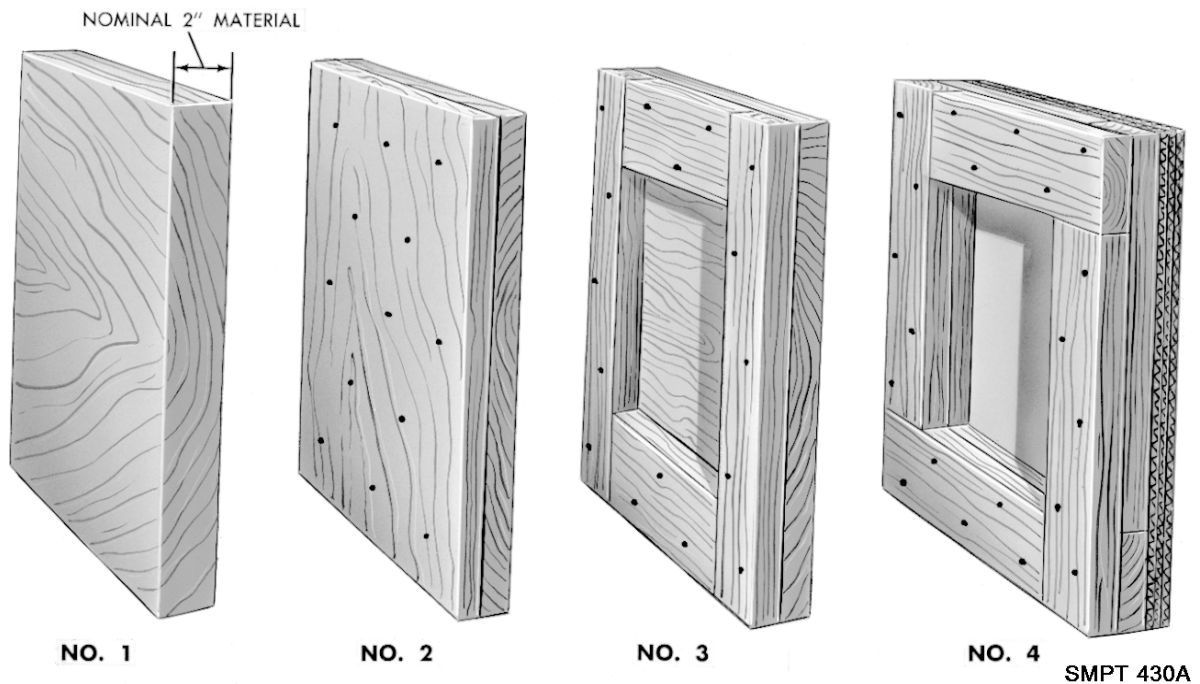


Figure 2-24. Types of ends to be used with styles A through D triple-wall corrugated fiberboard boxes.

**Limitations**

Maximum weight and size limitations for triple-wall corrugated fiberboard boxes are not given in ASTM D 5168. When triple-wall, corrugated fiberboard boxes are to be used for commodities covered in Rule 41 of the Uniform Freight Classification and item 222 of the National Motor Freight Classification, the sum of the inside length, width, and depth shall not exceed 125 inches. Containers exceeding these limitations must be made under a special package permit.

**Sealing**

When sealing against the entry of water or dust is required, all seams and joints of the boxes shall be covered with minimum 2-inch tape conforming to ASTM D 5486, Type V. Closure of slotted boxes is frequently done prior to sealing.

**Closure**

The kinds of closure for triple-wall, corrugated fiberboard boxes will depend on the style of box to be used, and may be made by means of nails, staples, steel straps, filament-reinforced tape, or a combination of these materials. When nails are used for closure or for fastening blocking and bracing members to the interior of the boxes, it is recommended that each nail should pass through an oversize washer, piece of banding, or clips designed to prevent pulling of the nail heads through the triple-wall material. Whenever reinforcing needed, DOD personnel may use ASTM D 3950, ASTM D 3953, or ASTM D 4675.

**Closure of style A boxes**

This style may be closed with zinc-coated or copper-washed staples, with divergent points and minimum dimensions of 14 gauge wire, 3/4 inch crown, and 1 1/4 inch legs; with flat, Type I, Class A or B, 5/8 inch wide and 0.018 inch thick steel straps conforming to ASTM D 3953 or with nonmetal strapping in accordance with ASTM D 3950, Type I or II (when Type I is used it shall be Grade B) with a nominal width of 5/8 inch; or with pressure-sensitive, filament-reinforced tape meeting the requirements of ASTM D 5330, Type III, 1/2-inch wide, except for Styles E and F, which shall be 1 inch wide. On weather-resistant boxes, the ASTM D 5330 tape shall be Type IV, 3/4 inch wide, except for Styles E and F, which shall be 1 inch wide.

**Using nails for closure of style A boxes**

When nails or staples are used, they shall be spaced not more than 2 inches apart and staggered as permitted by the thickness of the ends of the box. The nails or staples shall extend through each thickness of fiberboard and into the wood ends. If the box is 24 inches long, a strip of filament-reinforced tape shall be placed at the center of the outside top flap so as to extend onto the top flap 5 inches and onto the side panel 5 inches. For length greater than 24 inches, one such strip will be added for each additional 18 inch increment of length greater than 24 inches. The total number of strips will be spaced evenly (fig 2-25).

**Using straps for closure of style A boxes**

When steel or nonmetal straps are used, one band will be placed at each end of the box to encircle the top, sides, and bottom of the box. The straps will be placed not more than 3 inches in from the ends to bear evenly on the wood ends. If the box is 24 inches long, a strap will be added at the center.

Filament-reinforced tape may be used in lieu of this additional strap. For lengths greater than 24 inches, one such strap will be added for each additional 18 inches of length and placed so that they are evenly spaced (fig 2-25).

#### **Using Tape For Closure Of Style A Boxes**

When filament-reinforced tape is used, a 10-inch strip will be placed 2 inches in from each end of the box. For boxes 24 inches long or over, additional strip requirements are the same as for steel strapping. All the tape strips will be applied perpendicular to the joint formed by the top flap and the side wall of the box. They will be centered over the joint and extend 5 inches onto the top flap and 5 inches on the side wall (fig 2-25).

#### **Closure Of Style B Boxes**

Style B boxes may be closed with nails or staples in the same manner as Style A boxes; but, in addition, a staggered row of nails or staples, spaced not more than 2 inches apart, must be driven through the overlap portion of the top flap into the face of the wood ends. When using steel straps or filament-reinforced tape for closure, the same requirements as given for Style A boxes also apply to Style B (fig 2-25).

#### **Closure of Style C Boxes**

This style of box will be closed along the top and sides by means of nails, staples, or steel straps as specified for Style A boxes, except when using nails or staples they will be spaced not more than 2 inches apart and staggered and driven through the top one-half of the box into the wooden ends along the two end edges of each side panel and both end edges of the top panel (fig 2-26).

#### **Closure of Style D Boxes**

This style of box shall be closed along the top and sides by means of nails, staples, or steel straps as specified for style A. In addition, a staggered row of nails or staples shall be driven through the overlapping top flaps into the face of the wooden ends. For boxes 24 inches long and longer, strips of tape will be applied as for style A box (fig 2-26).

#### **Closure of Style E Boxes**

Style E boxes may be closed by the use of staples, steel or nonmetallic strapping, or with tape.

#### **Closure with Staples**

Staples will not be used for boxes fabricated with class weather-resistant fiberboard. Staples are placed not more than 1 1/2 inches, or less than 1 inch, from the free edge of the flap. Spacing around the edge of each flap is not more than 5 inches, center-to-center of the staples. Additional staples are so spaced within the boundaries outlined by the edge staples so that no area will have a diameter greater than 4 inches without a staple, with a minimum number of eight staples in each flap. Staples are flat wire, 0.050 inch thick, 0.085 inch wide, with a 1 1/4-inch crown (fig 2-27).



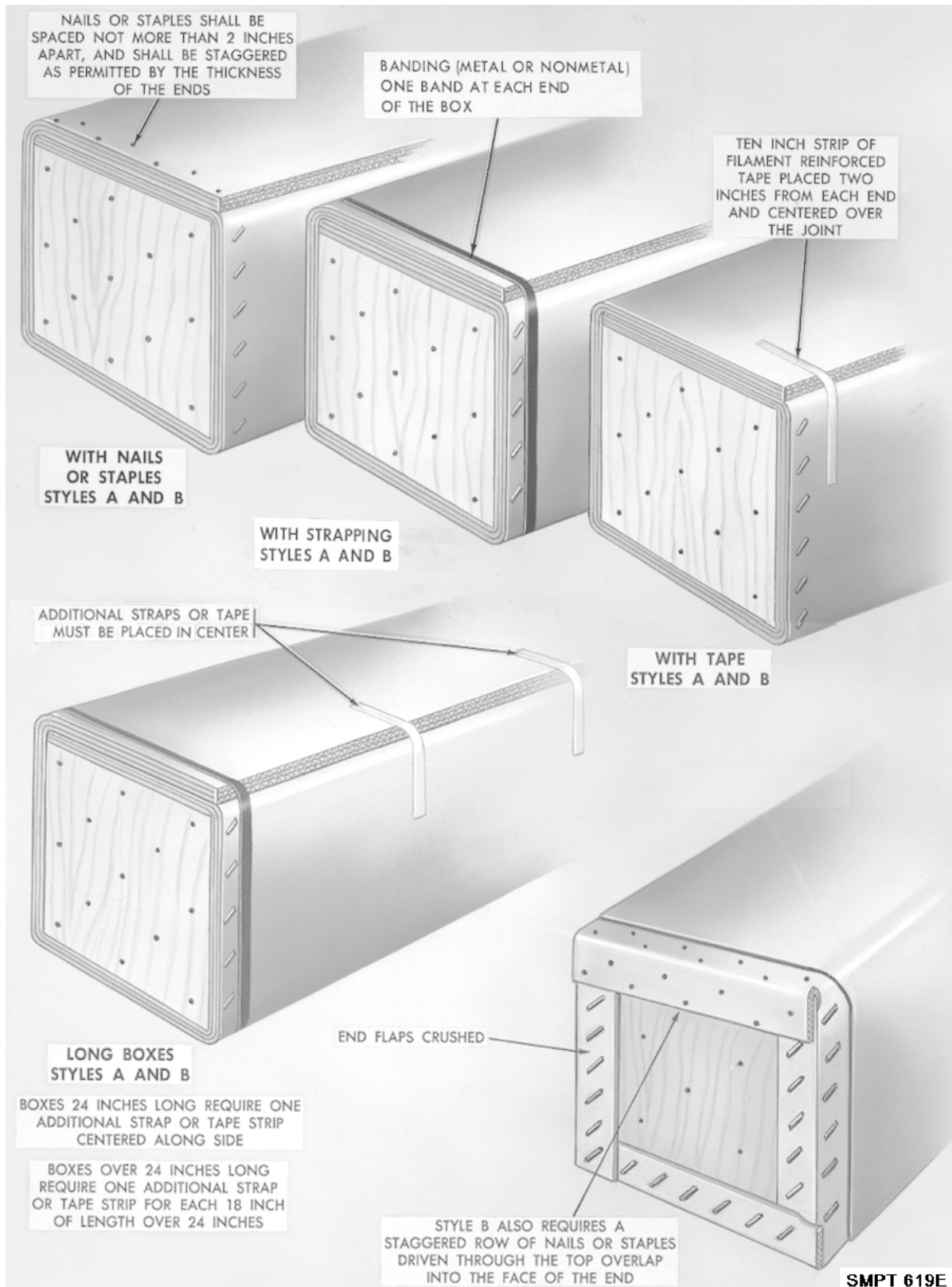


Figure 2-25. Closure of styles A and B, triple-wall corrugated fiberboard boxes.

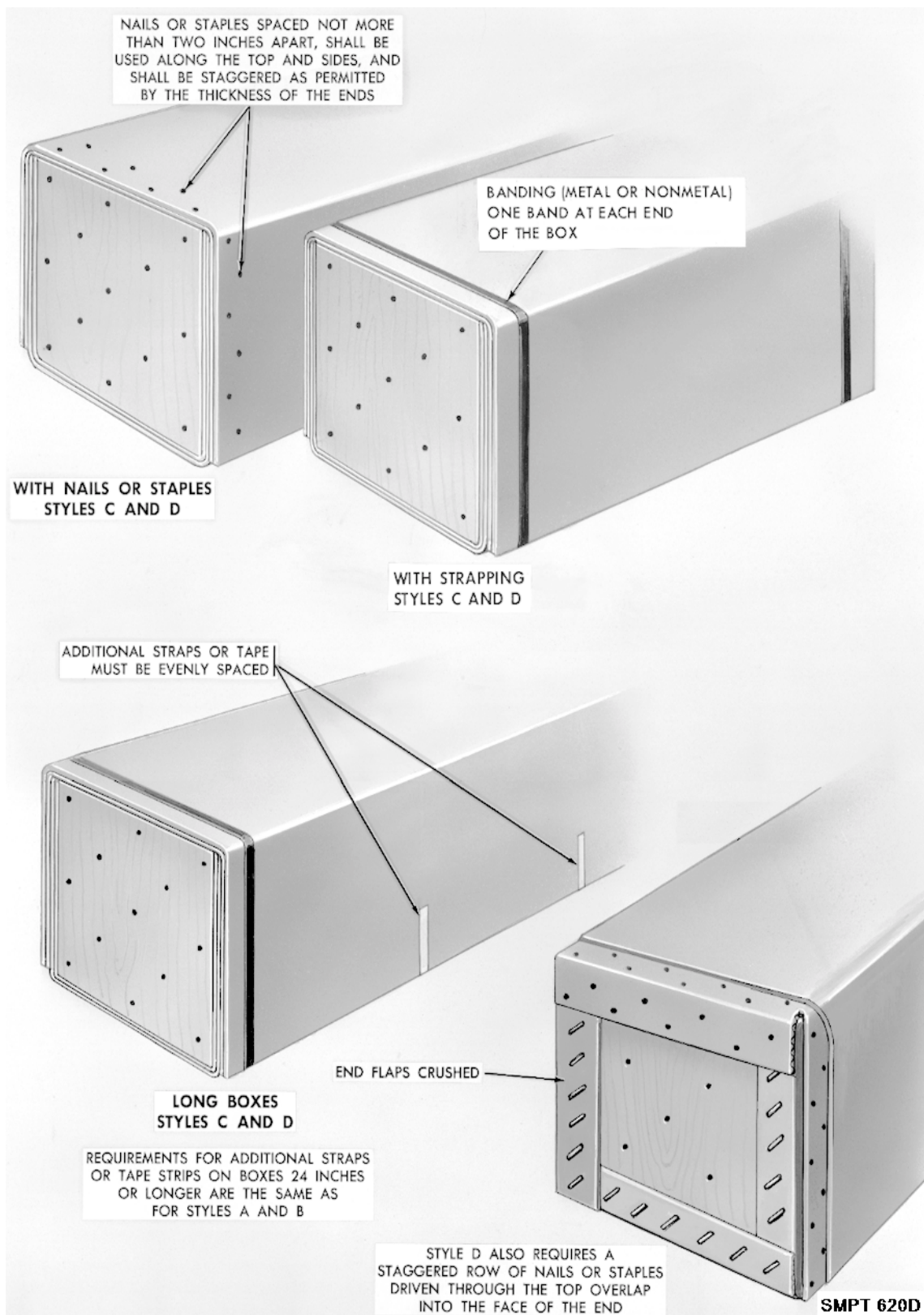


Figure 2-26. Closure of styles C and D, triple-wall corrugated fiberboard boxes.

### **Closure With Metal or Nonmetallic Strapping**

The requirements for closure with strapping is the same as for style A boxes, except that a lengthwise strap may be applied to hold the girthwise strap flat (fig 2-27).

### **Closure With Tape**

A 12-inch strip is applied to each end of the two top and bottom flaps so that 6 inches of each strip is attached to the flap and 6 inches of each strip is attached the end panel. The strips are located adjacent to the inner length edge of the flaps, approximately 2 inches from this edge. The use of additional strips will be specified for style A boxes.

### **Closure of Style F Boxes**

This style may be closed with steel or nonmetallic straps or filament-reinforced tape. When straps are used, they will be applied as described for style E boxes. When tape is used, one strip will be used on each side and each end. The strips will be not less than 12 inches long and will be applied at the center of the side and end panels and extend to the bottom of the box. When the length of the box is 24 inches, an additional strip will be added to each side and the two will be evenly spaced. Additional strips as required for length will be added to the ends when the box is 24 inches or greater in width (fig 2-28).

### **Closure of Style G Boxes**

When this box is used in conjunction with a pallet, closure and sealing will be as specified by the procuring activity. Without a pallet, an additional strip will be added to each side and the box will be closed with straps. One strap will be centrally located around the top, ends, and bottom. Two straps will be applied around the top, sides, and bottom, at a distance from the ends equal to three-fourths the length of the inner flaps. If the distance between the straps exceeds 24 inches, additional straps will be spaced not more than 24 inches apart (fig 2-29).

### **Paperboard Boxes**

Paperboard boxes are mainly used for interior packing. They are available in various types, styles, and sizes, and must conform to requirements of PPP-B-566, and PPP-B-676. In many instances, depending upon the item, a paperboard box may be used in packing when utilizing parcel post. For further details on paperboard boxes, see FM 38-700.



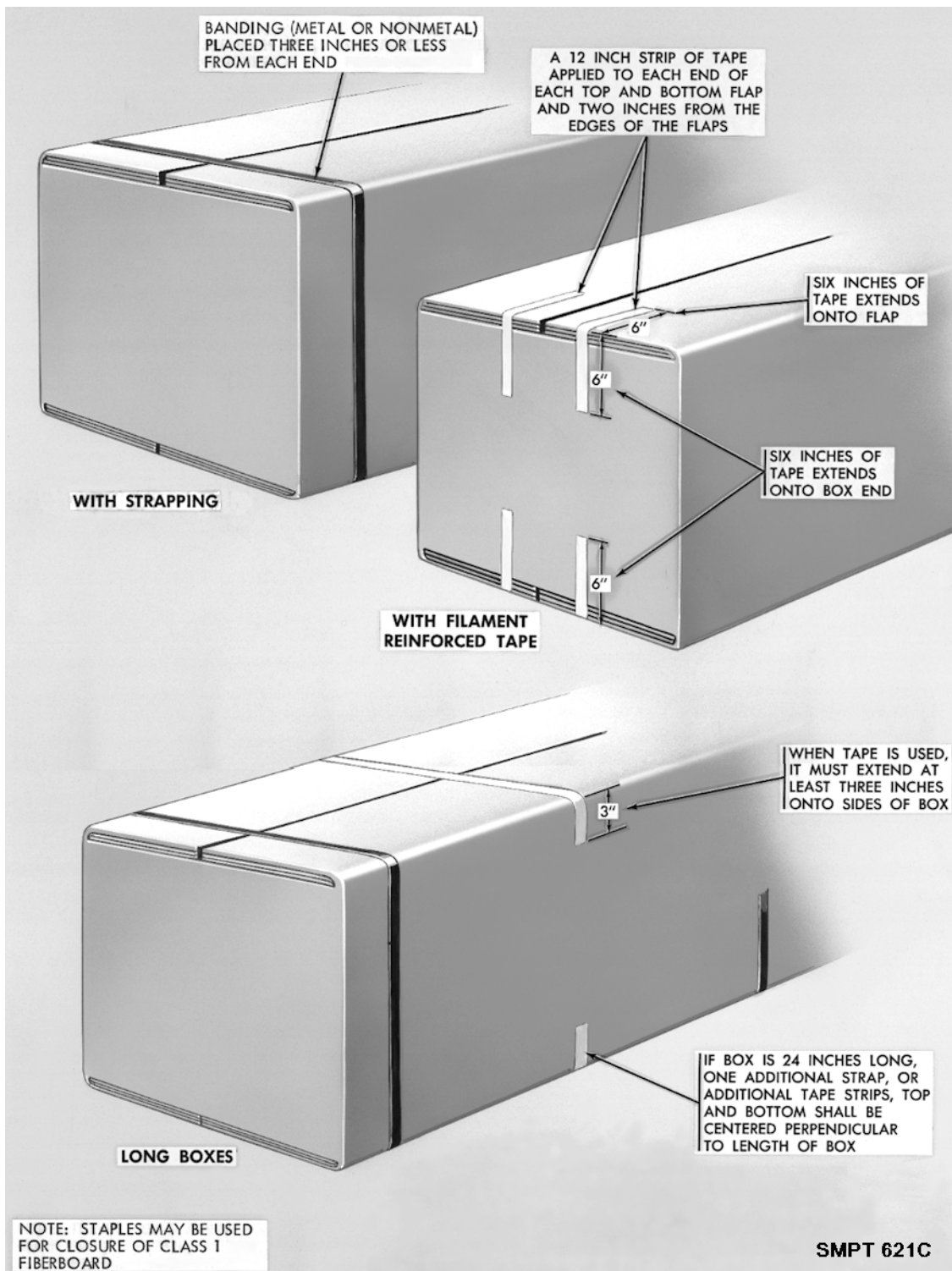


Figure 2-27. Closure of style E, triple-wall fiberboard box.

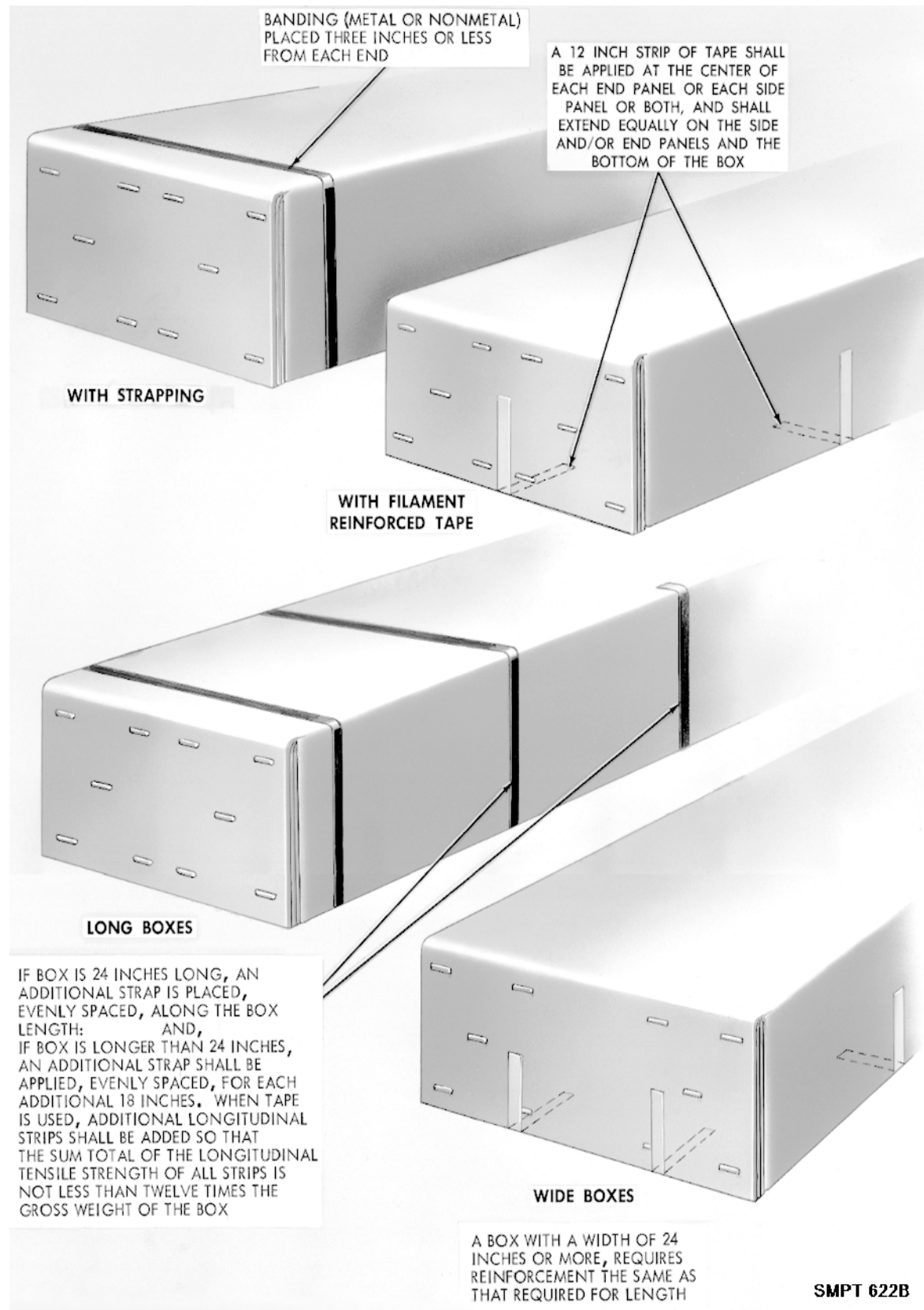


Figure 2-28. Closure of style F, triple-wall fiberboard box.

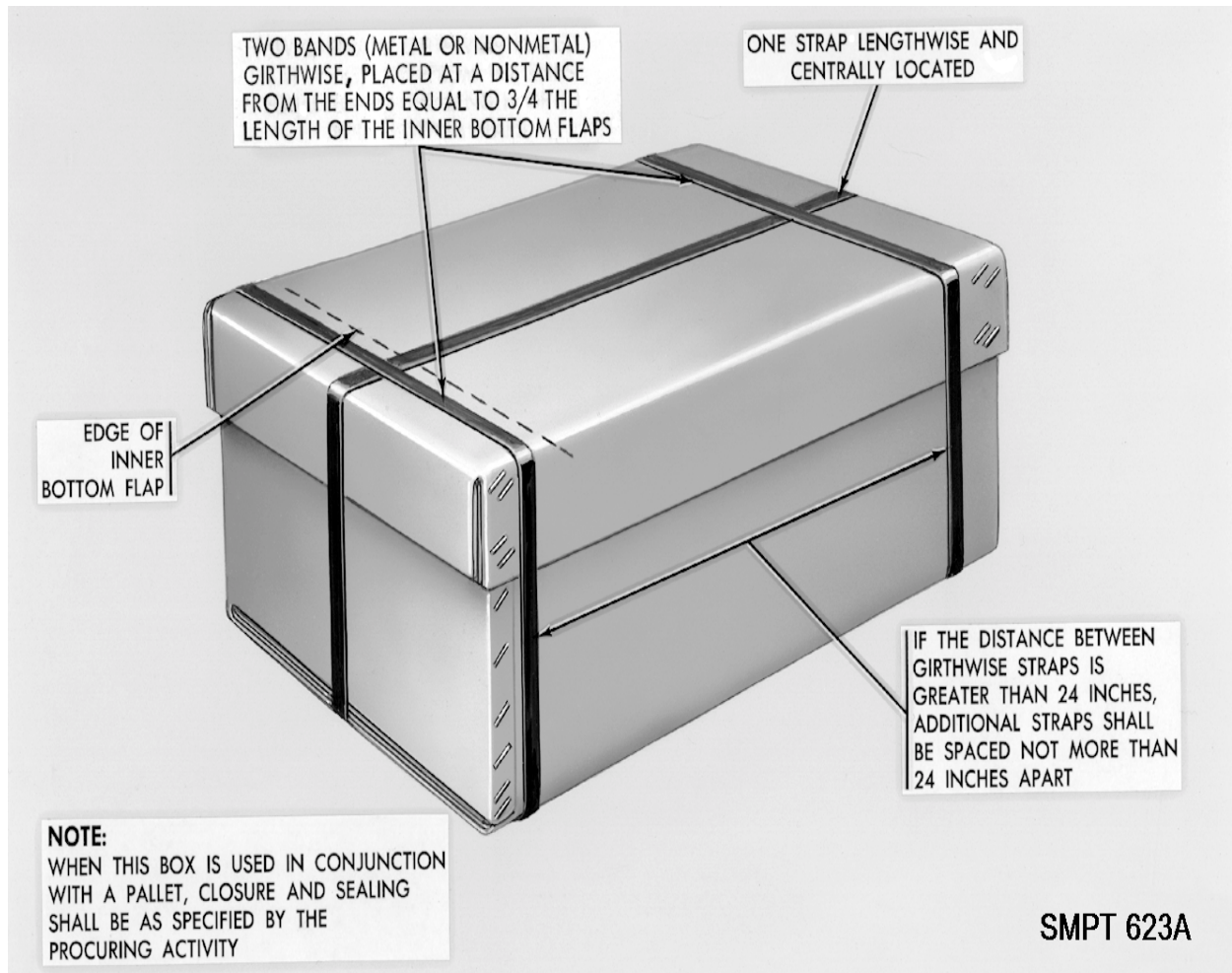


Figure 2-29. Closure of G style triple-wall fiberboard box.